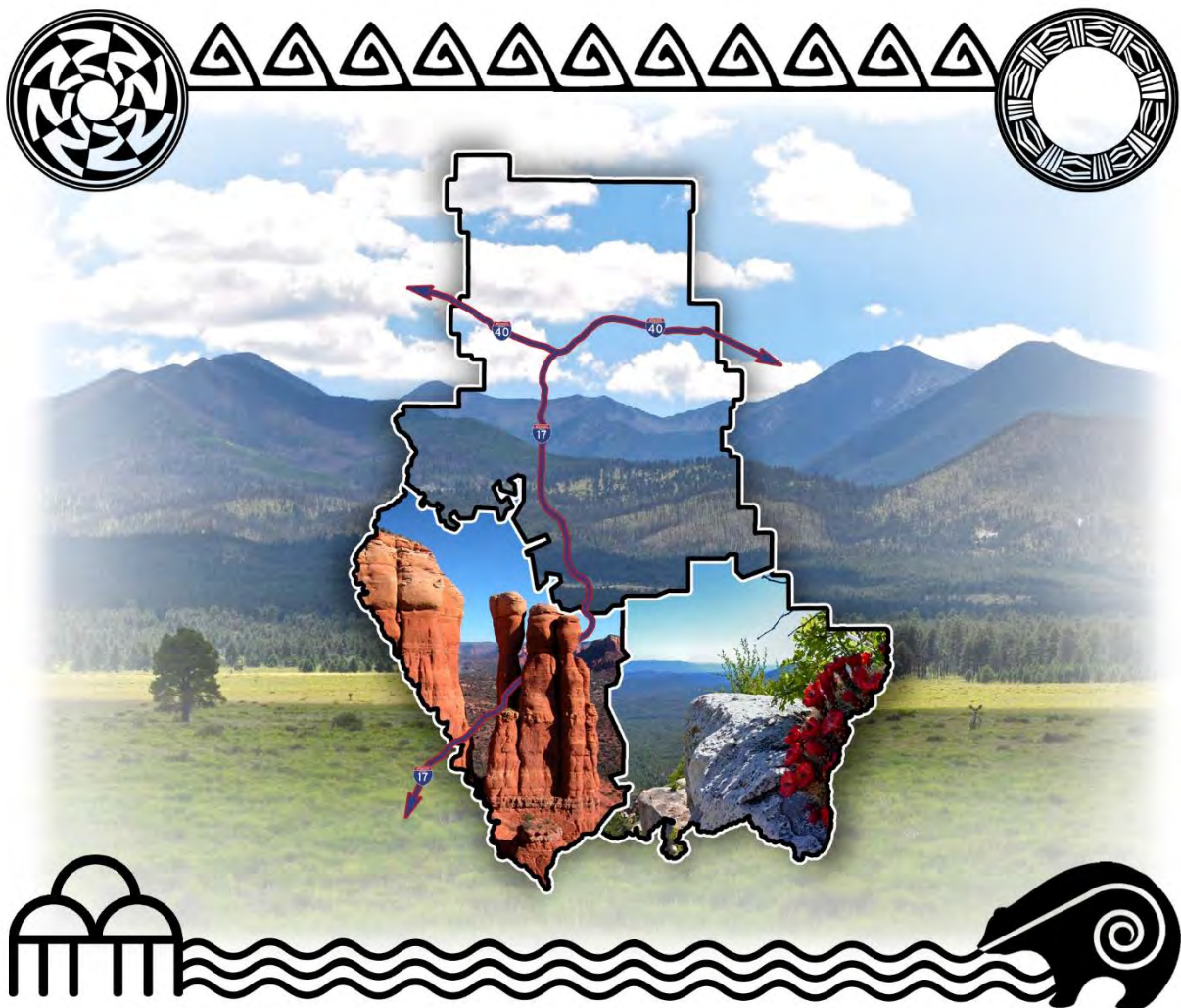




United States Department of Agriculture

# Land and Resource Management Plan for the Coconino National Forest

Coconino, Gila, and Yavapai Counties,  
Arizona



Forest  
Service

Coconino  
National Forest

Southwestern Region

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# **Land and Resource Management Plan for the Coconino National Forest**

**Coconino, Gila, and Yavapai Counties,  
Arizona**



# Preface

This land and resource management plan (also called the forest plan or plan) aims to promote responsible land management for the Coconino National Forest (Coconino NF) based on useful and current information and guidance. This plan replaces the previous forest plan, originally adopted in 1987. Land management planning guides the Forest Service in fulfilling its responsibilities for the stewardship of the Forest and to best meet the needs of the American people. This plan provides strategic guidance and information for project and activity decision making on the Coconino NF for approximately the next 15 years.

This plan was developed collaboratively and is the result of years of iterative discussions and feedback. Comments received were used to modify and refine the plan.

Both the plan and the associated final environmental impact statement (FEIS) can be found electronically on the Coconino NF website at:

<http://www.fs.usda.gov/detail/coconino/landmanagement/planning/>

Detailed assessments, evaluations, reports, and documents associated with development of the plan can also be viewed and downloaded from the Coconino NF Forest Plan Revision website.



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## Commonly Used Acronyms

**ADEQ** – Arizona Department of Environmental Quality

**ANST** – Arizona National Scenic Trail

**AZGFD** – Arizona Game and Fish Department

**BLM** – Bureau of Land Management

**BMP** – Best management practice

**d.b.h.** – Diameter at breast height

**ESA** – Environmental study area

**FRCC** – Fire Regime Condition Class

**FSH** – Forest Service Handbook

**GIS** – Geographic Information System

**HUC** – Hydrologic unit code

**MA** – Management area

**MSO** – Mexican spotted owl

**NEPA** – National Environmental Policy Act

**NF** – National Forest

**OHV** – Off-highway vehicle

**ORV** – Outstandingly remarkable value

**P** – Primitive

**ERU** – Ecological Response Unit

**RNA** – Research natural area

**ROS** – Recreation opportunity spectrum

**SIO** – Scenic integrity objective

**SPNM** – Semiprimitive non-motorized

**TEUI** – Terrestrial ecological unit inventory

**TMDL** – Total maximum daily load

**USFWS** – U.S. Fish and Wildlife Service

**VCC** – Vegetation Condition Class

**WUI** – Wildland-urban interface



# Chapter 1. Background

## Introduction

The Coconino National Forest [Land and Resource Management Plan](#) (hereinafter referred to as the forest plan or simply the plan) covers the [National Forest System lands](#) within the boundary of the Coconino National Forest (Coconino NF, the Coconino, or the forest), excluding land designated as experimental forest.

The Coconino NF is located in north-central Arizona (figure 1) in Coconino, Gila, and Yavapai Counties and encompasses approximately 1.8 million acres. The Coconino NF is managed by the Forest Service, an agency of the U.S. Department of Agriculture (USDA). Ranger district offices are located in Flagstaff, the Village of Oak Creek, and Happy Jack. The forest supervisor's office is located in Flagstaff.

## Purpose of the Land Management Plan

This plan aims to promote responsible land management for the Coconino NF based on useful and current information and guidance. Land management planning guides the Forest Service in fulfilling its responsibilities for the stewardship of the forest and to best meet the needs of the American people. The Forest Service's experimental forests are dedicated to long-term research on ecosystem processes, silviculture and forest management options, wildlife habitat characteristics, and forest growth and development. The Fort Valley and Long Valley Experimental Forests are located within Coconino NF administrative boundaries and are managed by the Rocky Mountain Research Station, not by the Coconino NF. Direction in this plan does not apply to experimental forests.

This plan provides strategic guidance and information for project and activity decision making on the Coconino NF for approximately the next 15 years. The plan is intended to provide additional direction not already provided by existing law, regulation, or policy. This plan does not include site-specific project and activity decisions. Project and activity decisions are analyzed separately. All project and activity decisions, however, must comply with the guidance provided by this plan unless amendments are made to the plan that allow for deviation.

The plan is a framework for sustaining native ecological systems and guides management toward appropriate conditions that support native plant and animal diversity. The plan integrates forest [restoration](#); watershed protection; resilience to changing climate; wildlife conservation; and social and economic values, goods, and services. The plan honors the continuing validity of private, statutory, or pre-existing rights.

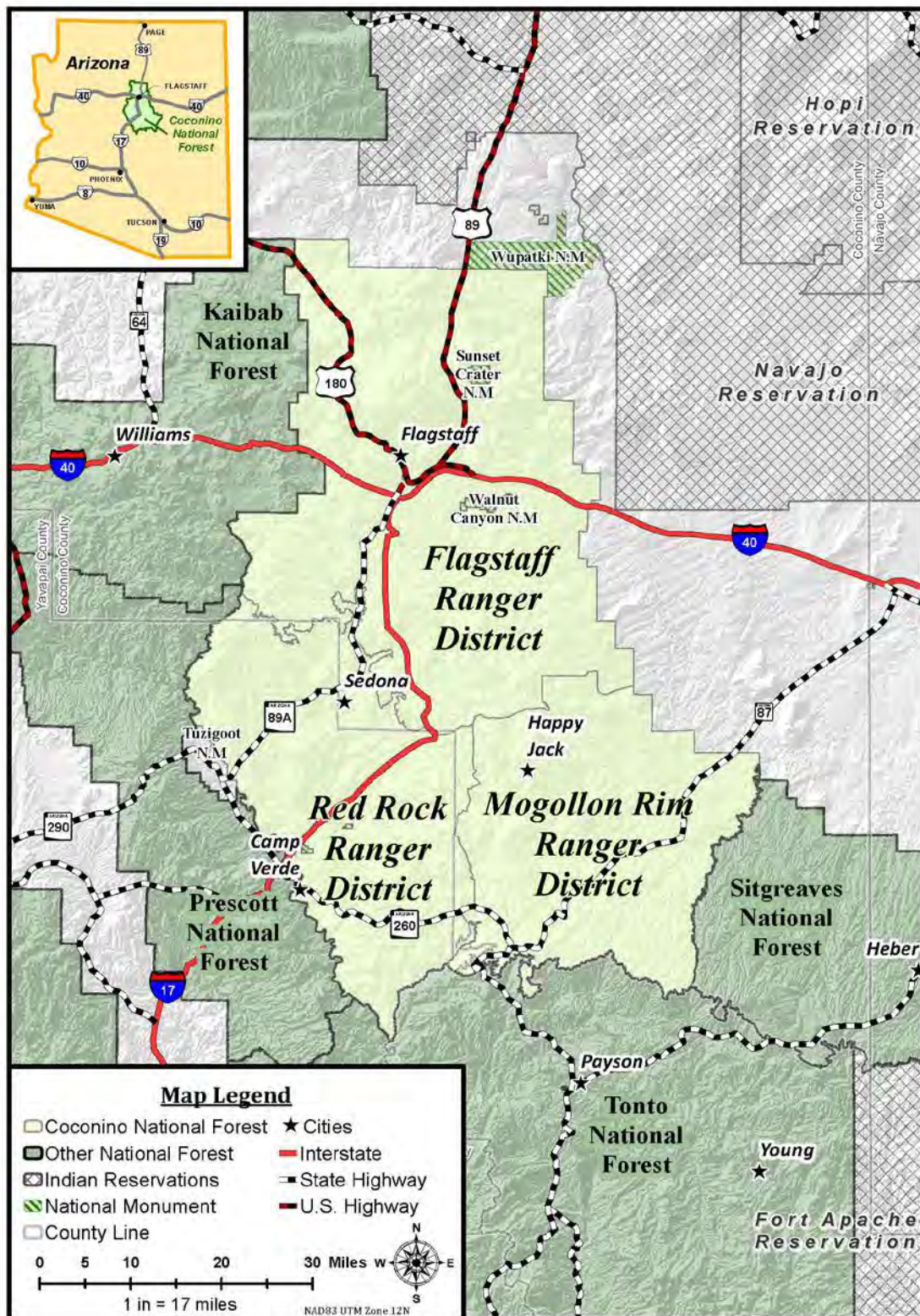


Figure 1. Vicinity map of the Coconino NF



## Summary of the Analysis of the Management Situation

The “Analysis of the Management Situation” (USDA Forest Service 2010a), published in May 2010, highlights the social, economic, and ecological conditions and trends in and around the Coconino NF, as detailed in the Forest’s “Economic and Social Sustainability Assessment” (USDA Forest Service 2008), the “Ecological Sustainability Report” (USDA Forest Service 2009), as well as the “Recreation, Grazing, Minerals, and Timber Demand Report” (USDA Forest Service 2010b). The “Analysis of the Management Situation” used these key findings, along with public input<sup>1</sup>, to identify areas in existing plan direction that do not provide adequate guidance for the present and future, and it attempts to consider potential implications of those plan needs for change to other resources. The Coconino NF leadership team used the Analysis of Management Situation and its supporting materials to determine the initial scope of plan revision topics.

Through this process, the leadership team also identified areas in the existing plan that should be retained. For example, key direction from the amendments for the Sedona-Oak Creek Ecosystem (Amendment 12) and the Flagstaff/Lake Mary Ecosystem Analysis (Amendment 17) were identified for retention. The direction found in these amendments is the result of substantial collaboration with forest stakeholders and public support for this direction remains strong. Furthermore, much of the direction found in these amendments addresses the needs for change that have been identified in other areas of the existing plan. Accordingly, there was little need for change associated with the direction found in these amendments and it has largely been incorporated into this revised plan.

Social and economic trends and conditions show increasing demand on the Coconino NF for a wide variety of human uses. Ecological conditions and trends demonstrate there are current and future threats to the [sustainability](#) of some of the Forest’s [ecosystems](#) and the species they support. Identified plan needs for change are summarized below and grouped into three broad topics: Recreation, Community-Forest Interaction, and Maintenance and Improvement of Ecosystem Health.

## Recreation

### Condition and Trends

Recreational use of the Coconino NF has changed significantly since the 1987 Coconino National Forest Land and Resource Management Plan (1987 plan) (USDA Forest Service 1987a) was developed. Some of the trends and conditions related to recreation include: increased use of [developed recreation](#) areas; changing demographics; increased conflicts in social values, culture, and expectations tied to public lands<sup>2</sup>; new types of recreation; the adoption of a new scenery management system; increased recognition of tribal cultural uses and values; and pressures on [riparian](#), [wilderness](#), and other special areas.

<sup>1</sup> See appendix B, Public Collaboration and Involvement/Other Planning Efforts, found in the “Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan” (USDA Forest Service 2017).

<sup>2</sup> For example, between those who believe that only recreational activities that are less disruptive of nature (wildlife viewing or hiking) should occur on the forest and those who believe the forest should be equally available for all recreation types (hiking, off-road vehicle use, large group events).

### **Needs for Change**

To allow for changing trends and conditions, the revised plan needs to:

- Update desired conditions and other plan components for recreation and [scenery](#) management where guidance is partial or absent in the 1987 plan.
- Update the plan components for existing special areas.
- Incorporate special area recommendations and related plan components into the revised plan.

## **Community-Forest Interaction**

### **Condition and Trends**

Relationships with the surrounding communities have changed significantly since the 1987 plan was developed. Some of the trends and conditions related to community-Forest interaction include: a shift from a commodity-based (such as timber, mineral development) to a service-based (such as recreation) economy; the influence of forest management activities on the local economy; population growth and loss of access and/or open space; and increased demand for community infrastructure.

### **Needs for Change**

To allow for changing trends and conditions, the revised plan needs to:

- Update plan language to acknowledge values related to preservation of open space and water.
- Update plan language to acknowledge potential future desires for community growth and expansion.
- Update guidance on energy and mineral development.
- Provide guidance related to forest products and consideration of [culturally important](#) forest products.
- Clarify regulatory authorities relating to air quality and include approaches for addressing smoke and [fugitive dust](#) emissions.
- Review and update plan guidance on communication sites.

## **Maintenance and Improvement of Ecosystem Health**

### **Condition and Trends**

Since development of the 1987 plan, there is new knowledge of forest ecosystems, and the emphasis of forest management has shifted from timber output to the maintenance and improvement of ecosystem health. Some of the trends and conditions related to ecosystem health include: recognition of each ecological resource on the Forest; forest resilience; changed frequency and severity of natural [disturbances](#) such as fire and drought; decline of aspen; loss of understory species; lack of current plan direction regarding rarer ecosystems (such as tundra, spruce-fir, riparian); and susceptibility to uncharacteristic disturbances (fire, drought, insects, and disease), climate change, [invasive species](#), and human-caused habitat [fragmentation](#).

### **Needs for Change**

To allow for changing trends and conditions, the revised plan needs to:

- Update desired conditions and objectives for soil resources.
- Integrate and update management direction for riparian, aquatic, and water resources.
- Incorporate desired conditions that reflect the composition, structure, and natural disturbance attributes appropriate for the different ecosystems, and integrate desired conditions across different resource areas.
- Address invasive flora and fauna.
- Ensure plan components address concerns of Forest analysis species<sup>3</sup> and their habitat.
- Address the importance of habitat connectivity.
- Address strategies to address effects of climate change.

### **Other Needs for Change**

Direction in the existing 1987 plan that is still current and timely will be carried forward into the revised plan, but other direction may be modified or removed for the following reasons:

- Administrative functions, such as budgeting, are not part of the planning process.
- Duplications or conflicts exist with direction found in existing law, regulation, or policy.
- Plan components are based on outdated information, such as policies, schedules of activities, or science.
- The format is inconsistent and hard to use.

New information and changing conditions will necessitate changes in management. Iterative and adaptive planning may facilitate the incorporation of new information into potential plan amendments. Under the National Forest Management Act of 1976 (P.L. 94-588), projects and activities must be consistent with the plan.

### **Climate Change Concerns**

The revised plan includes updated plan language for soil, riparian, aquatic, and water resources; changing climate; habitat connectivity; and noninvasive animals and grasses and other vegetation.

With respect to climate change<sup>4</sup>, observed concentrations of greenhouse gases are projected to increase, and climate change may intensify the risk of ecosystem change for terrestrial and aquatic systems, thereby affecting ecosystem structure, function, and productivity. Because the effects of climate change are difficult to discern in the short term from climate variability and

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<sup>3</sup> Forest analysis species are plant, animal, and aquatic species considered for analysis during the forest plan revision process.

<sup>4</sup> Climate change is a change in overall climate or its variability from season to season, persisting for an extended period (typically decades or longer). Climate change may be due to natural processes or human-caused changes in the composition of the atmosphere or in land use. The United Nations Framework Convention on Climate Change makes a distinction between “climate change,” which is attributable to human activities altering the atmospheric composition, and “climate variability,” which is attributable to natural causes (2011).

other contributing factors, it is addressed as an integrated part of this plan, rather than as a distinct set of plan direction. For example the desired conditions for all terrestrial [ecological response units \(ERUs\)](#) state, “Within their type and capability, terrestrial ERUs are [functioning properly](#) and are resilient to the frequency, extent, intensity, and severity of natural disturbances, and adapt to or are resilient to climate variability.”

Improved ecosystem function (that is, progress toward desired conditions) is presumed to improve the [resiliency](#) of ecosystems to withstand, recover from, or adapt to changes in disturbance patterns, such as changes in frequency, intensity, timing, and spatial extent, as a result of climate change. The nature of the revised plan to maintain or manage toward desired conditions, regardless of current or changing conditions (climate change), is intended to allow management of the Forest to adapt as necessary to continue moving toward ecological and social desired conditions. Although the revised plan monitoring program does not include components to specifically monitor climate change, it can track the Forest’s progress toward desired conditions and whether management activities are promoting resilient ecosystems, as well as provide indications about whether influences of climate change are hindering progress toward desired conditions.

Current conditions and trends related to climate change may be found in various documents used to develop and evaluate the revised plan, including the Ecological Sustainability Report, the Analysis of Management Situation, and other documents contained in the project record. The “Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan” (FEIS) also evaluates climate change with the potential effects of future management under this plan and its alternatives.

## Plan Content

This plan includes “plan decisions” and “other content.” Once plan decisions are approved, any substantive changes to them will require a plan amendment. A change to “other content” may be made using an administrative correction process. Administrative corrections are also used to make nonsubstantive changes to plan decisions such as data and map corrections, or updates and typographical errors. The public will be notified of all plan amendments and administrative corrections. See the Future Changes to the Plan section in this chapter for additional information on public notification of changes to the plan.

## Plan Decisions

Plan decisions are the equivalent of plan components. They include goals (hereafter identified as desired conditions), objectives, standards, guidelines, management areas, special areas, suitability, and monitoring.

- **Desired conditions** (or goals) set forth the desired social, economic, and ecological goals of the Coconino NF. They attempt to paint a picture of what we (the public and the Forest Service) desire the Forest to look like or the goods and services we desire it to provide. Desired conditions are generally expressed in broad, general terms; however, more specificity may be added to clarify the intent. Desired conditions are timeless in that there is no specific date by which they are to be completed. They are aspirations and not commitments or final decisions, which approve projects or activities, and they may only

be achievable over a long timeframe (several hundred years). In some cases, a desired condition matches the current condition, so the goal is to maintain the current condition.

Desired conditions are the focus of this plan. Management of the Coconino NF's resources will be directed toward achieving the desired conditions. They are the basis for the other plan components and describe the framework for future projects and activities.

Projects and site-specific activities must be consistent with desired conditions (see the [Guiding Future Projects, Program Plans, and Assessments](#) section below). The project documentation should explain how the project is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have concerning the maintenance or attainment of any desired condition. Projects that are not consistent with desired conditions would require a plan amendment.

To be consistent with the desired conditions of the plan, a project or activity, when assessed at the appropriate spatial scale described in the plan (such as landscape scale), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or
  - Be neutral with regard to progress toward plan desired conditions; or
  - Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term; or
  - Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long term.
- **Objectives** are concise, time-specific statements of measurable, anticipated results that help achieve or move toward desired conditions over the life of the plan. Objectives are projections based on recent trends, current and anticipated staffing levels, and anticipated budgets. Activities specified in objectives are intended to help make progress toward achieving desired conditions and represent just some of the outcomes or actions expected to accomplish movement toward desired conditions. Not every action or objective the Coconino NF may undertake is identified in the plan, just the primary ones.

Objectives may be exceeded or not fully achieved based on changes in environmental conditions, budgets, and other factors during the plan period, which may result in a need to re-evaluate plan objectives. Objectives are not decisions that authorize specific actions in specific locations; project-level planning and decisions are used to authorize specific actions in specific locations. Objectives are not targets, nor are objectives intended to be limitations on management activities. For example, an objective would not restrict the amount of treatment that can occur or the type of treatment that can be used.

- **Standards** are constraints upon project and activity design. A standard is an absolute requirement to be met in the design of projects and activities. A standard is applied only after it has been analyzed in project-level planning and included in a project decision. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; variance from a standard is not allowed except by plan amendment.

- **Guidelines** are sideboards that guide management activities and provide specifications that a project or activity would adopt unless there is a compelling or defensible reason to vary from the guideline. A guideline is applied only after it has been analyzed in project-level planning and included in a project decision. Unlike a standard, deviation from the explicit provisions of the guideline is permitted without a plan amendment, as long as the intent of a guideline is met. Deviation from the explicit provisions of a guideline, if it is meeting the intent of the guideline, must be documented in the project record. **Projects that deviate from a guideline's intent must be accompanied by a plan amendment that would allow for the deviation.**

- **Management areas** are spatially defined areas with a common set of plan components that differ from the general forest. Management areas are defined by the desired settings and types of uses that would occur within in them under the plan.

Where the plan provides plan decisions (desired conditions, objectives, standards, guidelines, suitability determinations, or monitoring) specific to a management area, a project or activity must be consistent with those area-specific decisions. The project documentation should describe how the project or activity is consistent with the area-specific decisions of the plan.

- **Special areas** are lands that have management direction that is more specific than forestwide and include lands designated as special areas by Congress or another delegated authority. Special areas are identified because of their unique or special characteristics. This plan provides direction for the following special areas: designated wilderness areas, recommended wilderness areas, designated and eligible wild and scenic rivers, national [trails](#), scenic [roads](#), established and proposed [research natural areas](#) and designated botanical and geological areas, and inventoried roadless areas.

Where the plan provides plan decisions (desired conditions, objectives, standards, guidelines, suitability determinations, or monitoring) specific to a special area, a project or activity must be consistent with those area-specific decisions. The project documentation should describe how the project or activity is consistent with the area-specific decisions of the plan.

- **Suitability** describes the appropriateness of applying certain resource management practices to a particular area of land. Suitability is determined based on compatibility with desired conditions and objectives in the plan area. A unit of land may be suitable for a variety of individual or combined management practices. Identification of an area as suitable for a particular use does not mean that the use will occur over the entire area. Likewise, identifying that a particular use is not suitable in a management area does not mean that the use will not occur in specific areas. Identification of an area as suitable for various uses is guidance for project and activity decision-making and is not a resource commitment or final decision approving or restricting projects and activities. Final decisions on resource commitments are made at the project level.

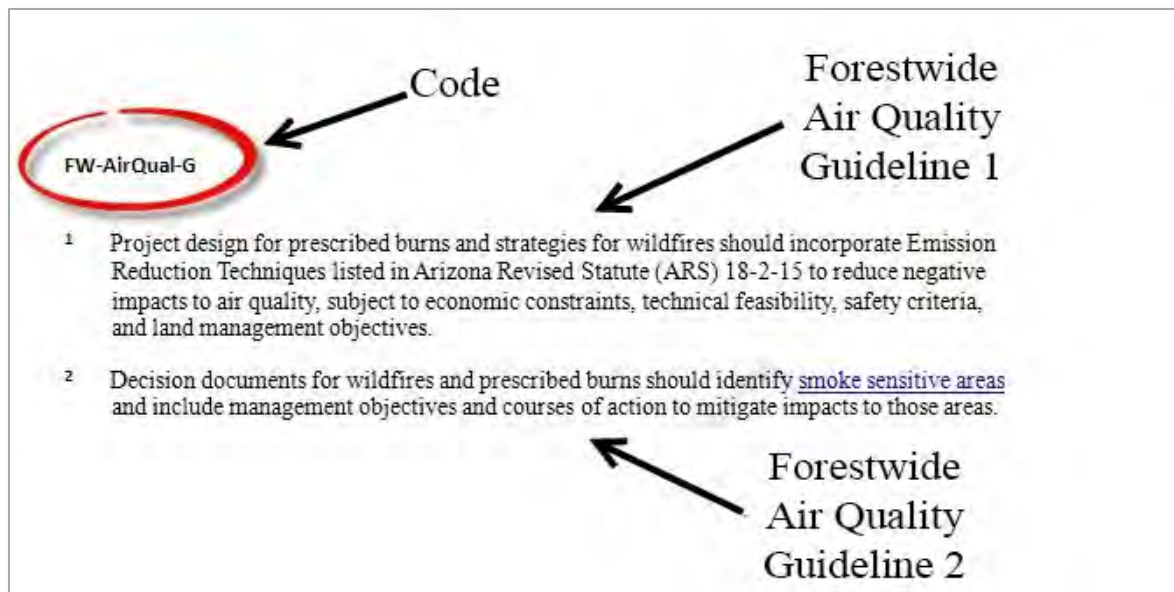
A project or activity can be consistent with plan suitability determinations in either of two ways:

- The project or activity is a use identified in the plan as suitable for the location where the project or activity is to occur; or
- The project or activity is not a use identified in the plan as suitable for the location (that is, the plan is silent on the use or the plan identifies the use as not suitable), but the responsible official determines that the use is appropriate for that location's desired conditions and objectives.

The project documentation should describe that the project or activity is either: (1) a use for which the area is specifically identified in the plan as suitable, or (2) not a use for which the area is specifically identified in the plan as suitable, but it is nonetheless appropriate for that location.

- **Monitoring** is used to determine the degree to which on-the-ground management is maintaining or making progress toward desired conditions. The monitoring plan includes questions and performance measures designed to inform implementation and effectiveness of plan decisions. It helps ensure that the plan remains adaptive, in that new knowledge and information can be analyzed and the plan changed accordingly.

Plan decisions are contained in chapters 2 through 5. In chapters 4 and 5, plan decisions are displayed within tables 14 through 21. In chapters 2 and 3, a code is used to reference and visually distinguish plan decisions more easily. Abbreviations are used in each code to identify: (1) if a plan decision applies forestwide (FW) or within a particular management (MA) or special (SA) area; (2) resource area; and (3) type of plan decision. The last part of each code is a number. For example “FW-Air-Qual-DC-1” refers to the forestwide direction for air quality, desired condition number 1; “MA-FlagN-O-2” refers to the management area direction for Flagstaff Neighborwoods, objective number 2; “SA-WSR-Verde-S-1” refers to the special area direction for the Verde Wild and Scenic River, standard number 1 (see figure 2 for a visual example).



**Figure 2. Visual example of plan decision code**

## Other Content

Besides the plan decisions mentioned above, the plan contains other content. Other content includes chapter 1, certain sections in chapters 3 and 4 (background and management approaches), and all appendices. These sections are meant to provide information and assist in understanding the larger management context. These sections are not mandatory direction.



The **general description and background** section is a narrative that provides an introduction and context for each resource or area. This section includes information on the location, history, associated resources, and other pertinent details. The primary sources for the information found in this section are derived from the Analysis of the Management Situation, Ecological Sustainability Report, Economic and Social Sustainability Assessment, and several resource evaluations.

The **management approach** sections help clarify how plan direction may be applied and identify probable management actions that are designed to maintain or move toward desired conditions and objectives. Management approaches describe the priorities and expectations for future program coordination. Partnerships and collaborative arrangements are also included as part of the management approaches for accomplishing desired conditions. Management approaches are strongly influenced by recent trends, past experiences, anticipated staffing levels, and short-term budgets. Decisions about what projects are actually proposed and approved, as well as details of project design, are determined by public involvement, science, and professional experience at the project or activity level.

The **appendices** provide additional information to the plan and include: maps, an overview of the proposed and probable management practices, a crosswalk of common and scientific species names, a list of other sources of information (such as relevant laws, regulations, and policies), and an index of documents that support the plan.

## Plan Organization

This plan is organized as follows:

**Chapter 1. Background** — briefly describes the Coconino NF, the analysis of the management situation, the purpose of the plan, plan content, and plan organization. For a quick preview of the plan structure, glance at the contents pages. This chapter contains no plan decisions.

**Chapter 2. Forestwide Management** — contains plan decisions and other content that are applicable forestwide.

**Chapter 3. Area-specific Direction** — contains plan decisions and other content that is applicable to particular management areas, in addition to forestwide direction.

**Chapter 4. Suitable Uses** — describes the appropriateness, or suitability, of certain resource management practices (uses) across the Forest.

**Chapter 5. Monitoring Strategy** — contains the monitoring plan decisions and provides a framework for subsequent monitoring and evaluation.

**List of Preparers** — contains a list of the specialists who contributed to development of the plan.

**Glossary** — contains definitions for technical terms used in the plan.

**References** — contains a list of citations for documents referenced in the plan.

**Appendix** — consists of multiple parts and supplements information contained in the plan.

Hypertext is used throughout the plan; it allows the user of the electronic version of this plan to click on a word (indicated by blue underlined text, for example [glossary](#)) and be redirected to another area of the plan or an external reference. Users can then click on the word in the



redirected location and return to their original location. In text, the first occurrence of words or terms found in the glossary is hyperlinked to the glossary definition.

## **Future Projects, Program Plans, and Assessments**

Project-level planning is the mechanism for plan implementation. Project planning translates the plan components (desired conditions, objectives, standards, guidelines, management areas, special areas, and suitability) in the plan into proposals that identify specific actions, design features, and project-level monitoring. Proposal development for projects addresses site-specific needs developed locally with input from experts and stakeholders and consideration of the most current and relevant information. Project decisions are made following public involvement and analysis. Important considerations in project development include consistency with the plan, consistency with higher-level direction, the project's potential effects on achieving desired conditions at multiple scales, and feedback from project- and plan-level monitoring regarding the effectiveness of management strategies.

Forest projects, activities, and management are to be consistent with the direction in this plan as well as with that from current law, regulation, and policy. In most cases, this plan does not repeat higher-level direction. Instead, it includes a partial list of applicable laws, regulations, executive orders, and policy for reference in appendix D.

Consistency with the revised plan will be achieved by developing management activities that are designed specifically to achieve the plan's desired conditions and objectives and are guided by relevant standards and guidelines. To the extent practicable, documentation for such projects should identify the elements of the desired conditions, goals, or objectives to be achieved by the project. It should not be expected that all projects or activities would contribute to all desired conditions, goals, or objectives, but rather to a limited subset. It should also be recognized that some projects designed to contribute to some desired conditions, goals or objectives may have consequences considered adverse to the achievement of other desired conditions, goals, or objectives. In this situation, the responsible official for the project needs to identify and disclose these effects in the project documentation and make a decision that balances these considerations. Management activities for projects that are necessary, but are not specifically related to one of these components of the plan (such as routine road and facility maintenance), should be briefly evaluated to assess if they conflict or impede contribution to the desired conditions or objectives.

A project or activity approval document must describe how the project or activity is consistent with the plan by the criteria listed at 36 Code of Federal Regulations (CFR) 219.15(d) (2012 Planning Rule). Where a proposed project or activity would not be consistent with plan direction (desired conditions, objectives, standards, guidelines, and suitability), the responsible official has the following options (36 CFR 219.15(c) 2012 Planning Rule):

1. Modify the proposed project or activity to make it consistent with the applicable plan components;
2. Reject the proposal or terminate the project or activity;
3. Amend the plan so that the project or activity will be consistent with the plan as amended;

4. Amend the Plan contemporaneously with the approval of the project or activity so that the project or activity will be consistent with the plan as amended. This amendment may be limited to apply only to the project or activity, and may be adopted at the same time as the approval of the project or activity (36 CFR 219.15(c) (4) 2012 Planning Rule).

Projects are also expected to apply the standards, guidelines, and suitability determinations, contained in this plan. The applicable standards, guidelines, and suitability determinations should be identified early in the project planning process. To ensure compliance with the plan, each project should document consistency with these plan components.

In order to ensure a project is consistent with the plan, its design and implementation should consider its setting, any management areas it overlaps, and the guidance for any resources or conditions that may be present in the area (such as cultural resources, non-native species, geologic formations, wildlife, etc.). Additionally, it should consider any potential conflicts with other authorized projects and activities. Project design should be consistent with forestwide plan direction except where superseded by management area direction, which takes precedence.

When using this plan to develop project specifications, it is important to keep in mind that desired conditions for all scales are applicable, regardless of the size of the project. Smaller projects need to consider the larger scales in terms of how they contribute to the desired conditions within the context of the larger-scale unit, and larger projects need to consider the design features required to ensure that the fine-scale desired conditions are achieved and maintained across the project area.

Consideration of scale is also important when evaluating progress toward desired conditions because the range of variability and distribution of conditions is affected by the scale at which they are viewed. For example, when desired conditions are articulated at larger scales, they represent an average of fine-scale conditions across broader areas. This may make conditions appear less variable when they are evaluated at large scales, even though variability exists at the smaller scales.

Plan- and project-level monitoring and evaluation are the tools for gathering information on progress toward desired conditions, the effectiveness of plan implementation, and the appropriateness of plan direction. This information is subsequently used to determine management needs and adjust management strategies, which, in part, determine the form of future projects and activities. As such, monitoring and evaluation are key elements of plan implementation, as they guide future management occurring under the plan. The monitoring plan contained in chapter 5 of this document, in conjunction with project-level monitoring, will provide the framework for enabling adaptive management on the Coconino NF.

## **Transition in the Implementation of the Plan**

The following transition direction is meant to ensure the orderly implementation of the revised Land and Resource Management Plan. A Land and Resource Management Plan is used as a direction source for future projects, plans, and assessments. A smooth and gradual transition to this plan is anticipated, rather than one that forces an immediate reexamination or modification of all contracts, projects, permits, and other activities that are already in progress. The new direction does not apply to any projects that have had decisions made prior to the effective date of this decision. Projects currently under contract, permit, or other authorizing instrument are not affected by the decision; however, projects may be modified to adopt all or part of this direction

where Forest Service managers deem appropriate. Re-issuance of existing authorizations will be treated as new decisions, which must be consistent with the new direction described in the plan subject to valid existing rights.

Authorizations for occupancy and use made before the final record of decision may proceed unchanged until time of reauthorization. At time of reauthorization, all permits, contracts, and other authorizing instruments must be made consistent with the revised plan, subject to existing valid rights, as provided at §219.15(d) (2012 Planning Rule).

The direction in this plan will apply to all project decisions made on or after the effective date of the plan decision. As required by the National Forest Management Act and the planning rule, subject to valid existing rights, all projects and activities authorized by the Forest Service after approval of this plan must be consistent with the applicable plan components (16 U.S.C. 1604(i)) as described at 36 CFR 219.15 of the 2012 Planning Rule. (Although the transition provisions at 36 CFR 219.17 of the 2012 Planning Rule allow revision of this plan under the 1982 regulations, subsequent projects or activities approved on units with plans revised under a prior planning rule must comply with the consistency requirement at section 219.15 of the current rule.)

Any resource plans (such as travel management plans) developed by the Forest Service that apply to the resources or land areas within the planning area must be consistent with the plan components. Resource plans developed prior to plan decision must be evaluated for consistency with the plan and amended, if necessary (36 CFR 219.15(e) 2012 Planning Rule).

## Future Changes to the Plan

A change to the plan requires either administrative correction or amendment. The following summarizes circumstances that warrant corrections or amendments to the plan:

- **Administrative changes** are any changes to the plan that are not a plan amendment or plan revision. These changes include:
  - ♦ Corrections of clerical errors to any part of the plan, including plan components.
  - ♦ Changes to plan content, including plan components, when necessary to conform the plan to new statutory or regulatory requirements, for which there is no discretion.
  - ♦ Changes to the plan monitoring strategy, after notice of the intended changes is made to the public and after public comment and feedback are considered.
  - ♦ Any other changes to plan content, except for changes to the substance of plan components, or to the application of plan components to specific areas within the planning area.

Procedures for administrative changes are outlined in 36 CFR 219.13(c) of the 2012 Planning Rule and section 21.5 of chapter 20 of the Land Management Planning Handbook (FSH 1909.12).

- **Project-specific plan amendments** are an option when a proposed project is not consistent with the plan. These amendments only accommodate the proposed project. They do not lead to permanent changes in plan components or apply to future projects.

Procedures for project-specific plan amendments are outlined in 36 CFR 219.13(a and b) of the 2012 Planning Rule and section 21.31 of chapter 20 of the Land Management Planning Handbook ([Forest Service Handbook \(FSH\) 1909.12](#)).

- **Programmatic plan amendments** are required for any adjustments to plan components that cannot be addressed through administrative changes or project-specific plan amendments. Programmatic plan amendments may be used to add, modify, or remove one or more plan components, or to change how or where one or more plan components apply to all or part of the plan area (including management areas).
- The procedures for programmatic plan amendments are outlined in 36 CFR 219.13(a and b) of the 2012 Planning Rule and section 21.31 of chapter 20 of the Land Management Planning Handbook (FSH 1909.12).

## Roles and Contributions of the Coconino NF

The distinctive characteristics of the Coconino NF frame the roles and contributions it provides to the local area, the State of Arizona, the Southwestern Region, and the Nation. The approximately 1.8 million-acre Coconino NF is located in north-central Arizona and is at the southern end of the Colorado Plateau. The Coconino NF is one of six national forests in Arizona, and it shares borders with the Apache-Sitgreaves, Kaibab, Prescott, and Tonto National Forests; private land; and lands administered by the State and the National Park Service. The forest is within a couple miles of the Navajo Nation and is adjacent to the Yavapai Apache Reservation in the Verde Valley. (See figure 1.)

The Coconino NF ranges in elevation from 2,600 to 12,633 feet. The northern part of the forest is dominated by the San Francisco Peaks, which includes Humphreys Peak, the highest point in Arizona. Numerous cinder hills and volcanoes of the San Francisco Peaks volcanic field are scattered across the northern portion. The Mogollon Rim is a 1,000-foot-high cliff that runs for about 200 miles across central Arizona. Deep canyons containing several [perennial streams](#) dissect the rim. On the forest, the Rim runs in a northwest-southeast direction from the Coconino NF boundary with the Kaibab NF, to its boundary with the Apache-Sitgreaves and Tonto NFs. The Verde River forms the southwestern boundary of the forest, while one of its major tributaries, Sycamore Creek, separates the Coconino from the Kaibab and Prescott NFs on the western border.

The Coconino NF has a high diversity of vegetation communities due to the wide range of elevations, complex topography, and the presence of water. Vegetation communities at the lowest elevations are desert communities and riparian areas supporting cottonwoods and willows, while the highest elevation atop the San Francisco Peaks supports the only alpine tundra in Arizona. In between, there are extensive areas of pinyon juniper, ponderosa pine, and mixed conifer interspersed with grasslands and scattered pockets of aspen. Riparian vegetation is supported by perennial and intermittent waters.

The Coconino NF contains more water than most of the surrounding landscapes and supports ephemeral, intermittent, and perennial [streamcourses](#). There are about 224 perennial stream miles on the forest. Mormon Lake is Arizona's largest natural lake. There are 11 reservoirs, constructed primarily for municipal water use, recreation, and livestock. The forest lies mainly in the Verde River and Little Colorado River Plateau groundwater basins. The areas of highest precipitation and [groundwater recharge](#) for these basins occur on lands within the Coconino NF. The forest also

contains about 78 riparian wetlands totaling more than 10,000 acres, the second highest number on National Forest System lands in Arizona. Over 200 springs occur on the forest.

The diverse ecosystems on the Coconino NF provide habitat for a wide array of wildlife, fish, and plants. There are a number of rare species such as the Wupatki Arizona pocket mouse, Chiricahua leopard frog, Little Colorado spinedace, and rare plants like the San Francisco Peaks ragwort and Arizona cliffrose. Fifteen native fish species occur on the forest. Portions of nearly 80 percent of the perennial streams support native fish. Some native fish species are known to occur only in this area.

The Coconino NF is a regional, national, and international year-round recreation destination. Visitors are drawn to the diversity of settings provided, including: warm grasslands in the Verde Valley, cool riparian respites in canyons, prominent red rock spires and buttes around Sedona, and snow-covered peaks and forests near Flagstaff. Visitors come to the forest seeking a change from summer heat and city living. Many people gravitate to water or snow-based activities. Others enjoy the diverse scenery of red rocks, grasslands, deserts, and cool forests.

The top five activities on the Forest are as follows (USDA Forest Service 2006, p. 14):

1. Viewing natural features (83.9 percent)
2. Hiking/walking (79.1 percent)
3. Viewing wildlife (70 percent)
4. Relaxing (64.8 percent)
5. Driving for pleasure (54.8 percent)

Visitors enjoy the [developed recreation sites](#) throughout the Coconino NF that include the Arizona Snow Bowl ski area, popular lakes, and campgrounds. There are abundant year-round [dispersed recreation](#) activities. Ten wilderness areas provide opportunities for solitude and backcountry experiences. Several interpretive areas, such as Elden Pueblo, V Bar V, Palatki, and Honanki, have been developed to highlight the rich archaeological heritage on the forest. Trails and roads provide numerous hiking, biking, horseback, and motorized vehicle access to natural areas in the forest landscape. Wildlife viewing, big game hunting, and fishing are popular activities. The Coconino NF is a destination for winter activities such as snow play, snowmobiling, skiing, and snowshoeing.

American Indians and ranchers are a significant part of Coconino NF history, and their traditional uses remain an important part of the cultural landscape.

Some additional features that make the Coconino NF unique on a regional and national scale include the following:

- Coconino NF ranges from 2,600 feet in elevation in the Verde Valley to 12,633 feet atop Humphreys Peak. This wide range in elevation makes the forest unique in Arizona, because it contains all major biotic communities except true desert. All of the alpine tundra on National Forest System lands in Arizona is on the Coconino NF.
- Night sky viewing opportunities abound, and four observatories are located within or adjacent to the Coconino NF boundary. In recognition of the area's unique and valuable

night sky viewing opportunities, Flagstaff became the world's first international "Dark Sky City."

- NASA astronauts used the Cinder Lakes volcanic field from 1968 to 1973 to train for the Apollo 11 through Apollo 15 missions. This training was vital to the success of the Apollo program and the first U.S. landing on the moon by Neil Armstrong and Edwin Aldrin in July 1969.
- The Coconino NF manages seven archaeological sites that are protected and open to the visiting public for their enjoyment and opportunity to learn more about our national cultural heritage: Sacred Mountain, Honanki, Palatki, V-V and Red Tank Draw Petroglyph sites; Clear Creek Ruins; Old Caves Pueblo; and the award-winning Elden Pueblo Project, one of America's Hands on the Land designated sites. In addition, there are six national monuments (Walnut Canyon, Sunset Crater Volcano, Wupatki, Montezuma Castle, Montezuma Well, and Tuzigoot) and four state parks (Red Rock, Slide Rock, Dead Horse Ranch, and Fort Verde) nearby.
- The Coconino NF has one of the highest rates of natural (lightning-caused) fire occurrences in the United States. Over a 23-year period, the forest had the highest natural fire occurrence rate in the United States for 18 years, and it was in the top 6 every year.
- The State of Arizona has designated three streams—Fossil Creek, Oak Creek, and West Fork of Oak Creek—as being outstanding state resources and classified them as [Outstanding Arizona Waters](#).
- The only two designated [wild and scenic rivers \(WSRs\)](#) in Arizona occur on the Coconino NF. The Verde River WSR is shared with the Prescott and Tonto National Forests. The Fossil Creek WSR is shared with the Tonto NF. Eleven additional segments in nine different streams are eligible for inclusion in the National Wild and Scenic Rivers System, including portions of the West Fork of Oak Creek.
- Fossil Creek contains the largest assemblage in Arizona of native fish species in a creek that is free of [non-native](#) fish. In addition, the [travertine](#) formation in Fossil Creek is of international significance, because it is of similar scale and significance with a handful of travertine systems in China, Afghanistan, Croatia, Italy, Guatemala, and Turkey. Stream chemistry creates travertine formations and gives the stream its unique turquoise color.
- The Coconino NF contains the two largest natural lakes in Arizona: Mormon Lake and Stoneman Lake.
- The Coconino NF has a greater proportion of the perennial stream miles relative to the proportion of watersheds that overlap the forest. Of particular note, the Coconino contains 55 percent of the perennial stream miles in the Middle Little Colorado River 4th code watershed, even though only 15 percent of the 4th code watershed is on the forest.
- Oak Creek has the largest number of caddisfly species reported in any drainage in Arizona.
- The Coconino NF has all of Arizona's big game species except buffalo (bison) and includes: pronghorn, black bear, bighorn sheep, elk, javelina, turkey, mountain lion, mule deer, and white-tailed deer.
- Several factors make the Coconino NF unique for its bald eagle habitat. Edgar Mearns documented the first bald eagle nest in Arizona at Stoneman Lake in the late 1800s. The largest concentration of bald eagles ever counted in Arizona (120 eagles) was counted on

the forest near Mormon Lake. Fifteen to 20 percent of all bald eagles counted in Arizona in the winter occur on the forest. The forest contains seven bald eagle nesting areas.

- Because of the wide range in biotic communities and natural features, the Coconino NF supports a high diversity of bat species. Of the 28 bat species known to occur in Arizona, 19 have been documented on the Coconino.
- The Coconino NF has one of the densest populations of Mexican spotted owl in Arizona and New Mexico, partly because the forest has all three types of preferred habitat: riparian forests associated with canyons, ponderosa pine-Gambel oak, and mixed conifer.

### **The Coconino National Forest's Mission**

“Caring for the Land and Serving People” is the Forest Service motto. This translates into sustaining the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations. The overall goal of managing National Forest System lands is to sustain the multiple uses of its resources in perpetuity while maintaining the long-term productivity of the land.





# Chapter 2. Forestwide Management

## Introduction

This chapter sets forth plan decisions and other content that apply forestwide. Plan decisions can be visually distinguished and referenced easily in this chapter by a coding system (described in detail in chapter 1 and shown in figure 2) that identifies: (1) where a plan decision is applicable (forestwide or within a specific management or special area); (2) what resource area is affected by the decision; and (3) what type of plan decision is being made.

See chapter 1 for descriptions of plan decisions (desired conditions, objectives, guidelines, and standards) and other content (general description and background, and management approaches). In the event of conflicts with other sections of this plan, the more restrictive plan decision always applies. Resolution of conflicts occurs through project or activity-level environmental analysis.

## All Ecosystems

### General Description and Background for All Ecosystems

These desired conditions apply to all ecosystems.

### Desired Conditions for All Ecosystems

FW-Eco-DC

- 1 Within their type and capability, ecosystems are functioning properly, provide habitat for native species, and are resilient to natural disturbances (such as flooding, fire, and periodic drought) and climate change. Ecosystem processes and contributions (for example, nutrient cycling, water [infiltration](#), and wildlife habitat) are sustained, as vegetation on the Forest adapts to a changing climate.
- 2 The composition, structure, function, and arrangement of [vegetation conditions](#) reduce the threat of uncharacteristic disturbances.
- 3 Uncharacteristic fires are infrequent as is the associated flooding and sedimentation into downstream communities, perennial streams and their tributaries, headwaters, wildernesses, and other areas and resources.
- 4 [Desirable non-native species](#) and subspecies are present and in balance with properly [functioning ecosystems](#). Ecosystem conditions promote [endemic](#) levels of invertebrates, including pollinators, and disease, with occasional outbreaks.

### Management Approaches for All Ecosystems

Following large or uncharacteristic disturbance events, focus management actions on human health and safety, long-term restoration, soil and watershed stabilization, restoration or protection of ecosystem processes and resource values.

Coordinate with neighboring jurisdictions, permit holders (including utilities and livestock permittees), and other interested parties when undertaking activities in permitted areas or easements.

Coordinate with Federal, State, and local entities, and other stakeholders regarding climate change research, trends, impacts, and adaptive strategies.

For areas that are resilient to the effects of drought and climate, consider management that results in reduced stress and promotion of seral diversity, resource availability, and plant migration where adaptive capacity is measured by the area where structure, composition, process, and connectivity are restored and maintained.

## **Air Quality**

### **General Description and Background for Air Quality**

The goals of air quality management are to meet human health standards, to meet visibility goals in areas of high scenic value, and to address and respond to other air quality concerns, such as nuisance smoke. The Clean Air Act of 1963 (Public Law (P.L.) 88-206) and its subsequent amendments, the Environmental Protection Agency's 1999 Regional Haze Rule (40 CFR Part 51), the Arizona Department of Environmental Quality's 2011 Regional Haze State Implementation Plan, and the Arizona Department of Environmental Quality's regulations on forest and range management burns (Title 18, Chapter 2, Article 15) provide requirements and guidance for air quality management on the Coconino NF. The Arizona Department of Environmental Quality (ADEQ) identifies two airsheds (Little Colorado River Airshed and Verde River Airshed) that overlap the Coconino NF. Management activities on the forest are coordinated with the ADEQ, as well as with adjacent agencies, to maintain and protect the air quality.

Human health standards are defined in the National Ambient Air Quality Standards (NAAQS) set by the Environmental Protection Agency (EPA), pursuant to the Clean Air Act for seven pollutants considered harmful to public health: carbon monoxide, lead, nitrogen dioxide, particulate matter 10 microns in size or smaller (PM<sub>10</sub>), particulate matter 2.5 microns in size or smaller (PM<sub>2.5</sub>), ozone, and sulfur dioxide. The NAAQS standards are located in the Code of Federal Regulations in Title 40, Part 50. Population centers with the potential to be impacted by management activities on the Coconino NF are the communities in and around Flagstaff, Sedona, the Verde Valley, the Grand Canyon National Park, the Havasupai Reservation, the Navajo Reservation, the Hualapai Reservation, and the Hopi Reservation. The Sedona/Camp Verde area is carefully monitored as it receives diurnal (daytime) air drainage from the Prescott, Kaibab, and Coconino National Forests. The southern end of the Verde River Airshed overlaps the Phoenix nonattainment area (areas that exceed NAAQS) for PM<sub>10</sub>, carbon monoxide, and ozone. However, due to prevailing wind conditions, prescribed fire activities and [wildfire](#) on the Coconino NF rarely affect the nonattainment portion of the Verde River Airshed.

The Clean Air Act assigns Federal land managers the responsibility to protect air quality-related values in national parks and wilderness areas, which are identified as Class I airsheds. Two of the 12 [Class I areas](#) in Arizona overlap a portion of the Coconino NF to the west (Sycamore Canyon Wilderness) and to the south (Mazatzal Wilderness). There are several Class I areas near the Coconino NF. The Pine Mountain Wilderness, and the remaining portion of the Mazatzal Wilderness, outside of the forest boundary, are Class I areas in the Verde River Airshed, located less than 20 miles from the Coconino NF. Petrified Forest National Park is a Class I area within the Little Colorado River Airshed, located about 120 miles east of the forest. The Grand Canyon Class I area is northwest of the Coconino.

To protect visibility in the national parks and wilderness areas of high scenic value, in 1977, Congress designated all wilderness areas over 5,000 acres and all national parks over 6,000 acres in existence at that time as mandatory Federal Class I areas, subject to the visibility protection requirements in the Clean Air Act. In 1999, the EPA established the Regional Haze Rule (40 CFR Part 51) for improved visibility in national parks and wilderness areas. Consistent with the provisions of Arizona Revised Statutes § 49-104 and § 49-404 and the Code of Federal Regulations (CFR) Title 40, § 51.102 through § 51.104, the ADEQ adopted a revised State Implementation Plan in 2011 to address visibility in Class I airsheds. Road dust (fugitive dust) has been demonstrated to be a measurable contributor on a regional level to visibility in the 16 Class I areas located on the Colorado Plateau (ADEQ 2011). Road dust (fugitive dust) is addressed by this plan through FW-Soil-G-2, which indicates that activities should be designed to limit detrimental soil displacement.

EPA defines nuisance smoke as the amount of smoke in the ambient air that interferes with a right or privilege common to members of the public, including the use or enjoyment of public or private resources. Complaints of the odor or soiling effects of smoke, poor visibility, and impaired ability to breathe, or other health-related effects are common examples. While no laws or regulations govern nuisance smoke, it effectively limits opportunities of land managers to use fire. Public discontent regarding nuisance smoke often occurs long before smoke exposures reach levels that violate NAAQS. The areas of particular concern for nuisance smoke from wildland fire on the Coconino NF are in or near Sedona, the Verde Valley, Flagstaff, the Grand Canyon National Park, Sycamore Canyon Wilderness, the Havasupai Reservation, the Navajo Reservation, the Hualapai Reservation, and the Hopi Reservation.

Federal agencies in Arizona fund a Smoke Management Group that is housed in the ADEQ offices. This group assembles and coordinates planned burning activities from all Federal agencies on a daily basis, and works closely with officials in ADEQ to approve or disapprove prescribed fire activities to help ensure compliance with both health standards and visibility goals.

The night skies over the Coconino NF offer professional and amateur astronomers exceptional viewing opportunities. Four astronomical sites are located on or adjacent to the Coconino NF, including the Lowell Observatory, the Naval Observatory Flagstaff Station, the Lowell Observatory Anderson Mesa Astronomical Observatory, and the Discovery Channel Telescope. To protect the night sky resource, the cities of Flagstaff, Sedona, and Cottonwood, as well as Coconino and Yavapai Counties, have adopted codes to address outdoor lighting.

### **Desired Conditions for Air Quality**

#### **FW-Air-DC**

- 1 Air quality on the Coconino NF meets State and Federal air quality standards. Visibility in Class I areas meets regional haze regulations.
- 2 Night skies are clear and dark, providing for stargazing and professional astronomy.

### **Guidelines for Air Quality**

#### **FW-Air-G**

- 1 Project design for prescribed burns and strategies for wildfires should incorporate emission reduction techniques, such as those listed in Arizona Administrative Code R18-2 Article 15,

to reduce negative impacts to air quality, subject to economic constraints, technical feasibility, safety criteria, and land management objectives.

- 2 Decision documents for wildfires and prescribed burns should identify [smoke sensitive areas](#) and include management objectives and courses of action to mitigate impacts to those areas.

### **Management Approaches for Air Quality**

To promote public awareness and protection of human health and safety, notify stakeholders and the public about potential smoke from fire activities through methods of advanced notification through the media and smoke warning signs along roads when visibility may be reduced due to wildland fire.

Coordinate with ADEQ during prescribed burns to comply with State and Federal regulatory requirements for emissions and impacts to Class I areas.

Coordinate with ADEQ during wildfires to ensure ADEQ is aware of potential smoke impacts to [receptors](#).

Consider design features, [best management practices \(BMPs\)](#), or mitigation measures to reduce fugitive dust where needed.

## **Soil**

### **General Description and Background for Soil**

Soil is a mixture of organic matter, minerals, gases, and organisms. Soil performs four important functions: it is a medium for plant growth; it is a means of water storage, supply, and purification; it modifies the Earth's atmosphere; and is a habitat for organisms that decompose organic matter and create habitat for new organisms. The ability of soil to function within ecosystem boundaries is important to sustain biological productivity, maintain environmental quality, and promote plant and animal health.

Soils are variable on the forest and range from hot, dry desert soils at the lowest elevations to cold, moist soils found in the alpine tundra at the highest elevations. Soils are inventoried and classified in the terrestrial ecological unit inventory (TEUI) called the [Terrestrial Ecosystem Survey](#) of the Coconino NF. The plan refers to Mollisol soil in several locations. Soils classified as [Mollisols](#) are those with relatively thick organic surfaces. They are typical of and develop under grassland conditions.

### **Desired Conditions for Soil**

FW-Soil-DC

- 1 Soils function properly to distribute water and cycle nutrients to a variety of vegetation including lichens, mosses, grasses, [forbs](#), shrubs, and trees.
- 2 [Soil productivity](#) and functions are sustained and functioning properly within the capability of the site, so the soil has the ability to resist [erosion](#), infiltrate water and recycle nutrients. Coarse woody debris, including downed logs, provides for long-term soil productivity. Soil productivity and functions contribute to the resiliency and adaptability of terrestrial and riparian ecosystems to climate change.

- 3 Vegetative ground cover is maintained at levels that contribute to suitable hydrologic function, soil stability, and nutrient cycling. Soils are protected by adequate vegetative ground cover on the soil surface to prevent erosion from exceeding [natural](#) rates of soil formation (soil tolerance), within their inherent capability. Soils are permeable and capable of infiltrating water to reduce instances of [overland flows](#) during precipitation events. The composition of grass and forb species and presence of plant [litter](#) and grass, forb, shrub, and tree [basal area](#) surface cover reduce occurrences of compaction and erosion.
- 4 [Biological soil crusts](#) stabilize soil and improve nutrient cycling.
- 5 Localized short-term accelerated soil erosion occurs following high-severity fires (Fire Regimes IV and V), but it does not occur to the extent that it risks long-term impairment to connected waters downstream or causes loss of soil productivity over major portions of the 5th or 6th code watershed.

### **Objectives for Soil**

#### FW-Soil-O

- 1 Maintain satisfactory [soil conditions](#) and/or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10-year period over the life of the plan. Maintenance and improvement would occur as a result of some management actions in other resources. For example, re-locating a road in a grassland could improve impaired soil conditions.

### **Guidelines for Soil**

#### FW-Soil-G

- 1 The forest should implement and monitor BMPs for all activities with the potential to impair water quality in accordance with the intergovernmental agreement between ADEQ and the Forest Service Southwestern Regional Office to control and manage nonpoint source pollution.
- 2 Projects should be designed to avoid disturbance that would result in long-term impacts to soil function and productivity. Where disturbance cannot be avoided, project-specific soil and water conservation practices should be developed.
- 3 Project-specific design features should be used when projects occur on slopes with a grade of about 40 percent or greater, on soils with moderate or severe [erosion hazard](#), or on soils that are sensitive to degradation when disturbed, such as calcareous soils, to minimize or avoid soil impacts.

### **Management Approaches for Soil**

Use published terrestrial ecosystem survey information: (1) for broad resource and forestwide assessments and land management and project planning at regional, forest, and district levels; (2) as the basis for determining project goals and objectives, desired ecological conditions, and for predicting effects and impacts of the different management prescriptions and activities upon each terrestrial ecosystem; and (3) for the initial selection of areas for proposed projects.

Conduct onsite soil investigations and refine mapping for soil-disturbing projects that require site-specific, precise, highly detailed soil information, which is beyond the scale of the terrestrial ecosystem survey. Analyze or collect site-specific terrestrial ecosystem survey information as needed to accurately determine limitations, suitability, and productivity potentials of the different terrestrial ecosystems that occur.

Work with the Rocky Mountain Research Station and other research organizations to understand the linkages among the physical and biological components of soil and plant populations that can inform managers on responses of ecological and hydrological structure and function to management and disturbance.

## **Biophysical Features**

### **Geological Features**

#### **General Description and Background for Geological Features**

Geological features include caves, [karst](#), cliffs, and talus slopes. The Coconino NF contains many karst/limestone and volcanic/lava tube ([pseudokarst](#)) cave resources that have been designated as a [significant cave](#), such as Lava River Cave, a designated recreational cave. On the forest, the karst and pseudokarst terrain is part of the Colorado River Plateau karst region, which encompasses 51 percent of the surface area on the Coconino. Cliffs are distributed forestwide and are especially notable within numerous canyons on the forest, along the Mogollon Rim, in the Red Rock-Secret Canyon Wilderness, and on prominent landforms such as Mount Elden. Talus slopes have unique geology, geomorphology, and microclimates, and occur at all elevations on the forest. Talus slopes are found in Oak Creek Canyon, Hackberry Mountain, the San Francisco Peaks, and the cinder cones in the San Francisco Peaks volcanic field.

Caves include any naturally occurring void, cavity, recess, or system of interconnected passages beneath the surface of the Earth or within a cliff or ledge, and that is large enough to permit a person to enter, whether the entrance is excavated or naturally formed. This definition includes any fissure, crack, lava tube, natural pit, sinkhole, or other opening, which is an extension of a cave entrance or an integral part of the cave.

Cave resources include any material or substance occurring naturally in caves such as plant and animal life, archaeological materials, paleontological deposits, water and sediments, minerals, cave formations, and cave relief features. Most cave resources are not replaceable or renewable. Some caves are of traditional importance to various American Indian groups.

Caves provide nest, roost, and den sites, and habitat for endemic species. A cave's suitability for bat roost and hibernacula is determined primarily by cave microclimate; particularly temperature and humidity, as well as protection from disturbance. Bats, especially large roosting colonies, are important to cave ecosystems because cave ecosystems rely almost entirely on the surface for nutrients and bats deposit considerable amounts of surface nutrients into caves via guano. Consequently, cave-roosting bats can support an entire ecosystem, and are often considered keystone species.

A karst landscape is associated with soluble bedrock, usually limestone and dolomite. Karst terrain on the forest is characterized by sinkholes, collapse features, and caves. Pseudokarst consists of landforms and terrain similar to karst, but is formed in processes that do not involve solution of bedrock formations. Pseudokarst found on the Coconino includes lava tubes and

collapsed lava tubes, badlands and piping pseudokarst, and crevice and talus pseudokarst. Ephemeral and intermittent streamcourses can lead into and “disappear” into caves and sinkholes. These are karst features called “sinking streams” that provide nutrients and moisture for cave ecosystems, which can be hundreds of acres in size. Karst features create unique microhabitats that are important areas for rapid subsurface drainage and aquifer recharge.

Karst hydrogeology is typified by a network of interconnected fissures, fractures, and conduits in place in a relatively low permeability rock matrix. Most of the groundwater flow in the karst terrain occurs through the fractures and openings underground. Karst and other subterranean hydrological systems are important to the sustainability of the cave ecosystem, related interdependent fauna, and overall beneficial uses of the groundwater and surface water system.

Cliffs are vertical or near vertical rock faces. They range in size from a few feet to hundreds of feet tall and are inherently dynamic, subject to rock fall, ice, and wind and water erosion. Cliff resources include any naturally occurring material or substances such as plant and animal life, paleontological deposits, and minerals.

Cliffs have unique geology, geomorphology, and microclimates, and provide habitats for plants and animals adapted to a vertical environment. They provide perches, roosts, and nest sites for raptors such as peregrine falcons, and microsites for a variety of vegetation.

Talus slopes are geological features composed of a collection of fine to coarse rock fragments at the base of mountains or cliffs accumulated through periodic rock fall from adjacent cliff faces or steep slopes. Talus slopes comprise the slopes of cinder cones. Length, width, and depth of talus slopes can vary widely as can the size of rock fragments. They are inherently dynamic, subject to natural rock movement, freeze-thaw action, wind and water erosion, and avalanches.

Talus slope resources include any material or substance occurring naturally such as plant and animal life, sediments, and minerals as well as associated archaeological features. They provide habitat and hibernacula for small mammals, reptiles, and invertebrates. The federally threatened San Francisco Peaks ragwort occurs on talus slopes.

### **Desired Conditions for Geological Features**

#### **FW-BioPhys-Geo-DC**

- 1** Geological features are generally undisturbed by human activities. The cultural, archaeological, geological, hydrological, paleontological, biological, and aesthetic resources associated with caves, karst, talus slopes, and cliffs are maintained.
- 2** Karst landscapes and cave formations continue to develop or erode under natural conditions. Water flowing into, from, or within these systems contains naturally fluctuating background levels of water, sediment, organic matter, and dissolved minerals; and is not polluted.
- 3** Caves and karst provide habitat for species, particularly bats, that require specialized niches for raising young, roosting, and overwintering. Caves maintain humidity, temperature, and disturbance levels consistent with historic conditions. Caves known to be important for endemic, rare, federally listed, Southwestern Region sensitive species, or cave-roosting bats are intact or provide habitat for these species. Disease is within natural levels.

- 4 The structure, composition, and function of the ERUs around caves, sinkholes, and lava tube openings protect and maintain the subterranean microclimate and ecology that has evolved over geologic time. Conditions are generally on the higher end of the range given in the desired conditions for the individual ERUs.
- 5 Significant caves have excellent examples of the values for which they were designated, with little evidence of human activity or disturbance. Visitor access and use occurs at levels that maintain the values of the significant cave.
- 6 Cliffs provide specialized habitats for a variety of species including nesting and feeding habitats for birds of prey and roosting habitat for bats. They provide escape, bedding, and lambing cover for bighorn sheep. They provide habitat for rare plants such as cliff fleabane and Senator Mine alumroot.
- 7 Talus slopes provide specialized habitats for lichens, plants, invertebrates, and vertebrates, including rare and federally listed species, such as the San Francisco Peaks ragwort. They maintain natural levels of moisture and are free from excessive sedimentation.

#### **Standards for Geological Features**

##### **FW-BioPhys-Geo-S**

- 1 Designated or nominated significant caves shall be managed to perpetuate those features, characteristics, values, or opportunities for which they were designated.

#### **Guidelines for Geological Features**

##### **FW-BioPhys-Geo-G**

- 1 Projects should be designed and uses should be managed to maintain the integrity and function of caves, karst, cliffs, and talus slopes. Where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function.
- 2 Projects and activities should be designed to prevent siltation into sinkholes and cave entrances, collapse of cave passageways, and alteration of the chemical, physical, and biological conditions of the cave resource. A radius of 300 feet should be used for restrictions on activities that can alter the cave's resources, functions, and associated features unless site-specific adjustments are made, based on topography, drainage, soil type, and the expected impact of the proposed activity.
- 3 If previously undiscovered caves are encountered above the zone of saturation for the regional water aquifer during drilling operations, precautions should be taken to protect the cave, including sealing the casing above and below the cave to prevent airflow and water leakage to maintain sensitive ecosystem conditions.
- 4 Blasting and/or controlled-source seismic surveys requiring explosives or other disruptive techniques should avoid, where possible, or minimize damage to cave features, condition, and function. The purpose is to maintain the chemical, physical, and biological conditions of the cave.
- 5 When closing caves to public entry, wildlife friendly gates that meet Bat Conservation International recommendations should be installed to protect bats and/or other wildlife species that are present.



- 6 Caves and abandoned mines that are used by bats should be managed to prevent disturbance to species and spread of disease such as white-nose syndrome (*Pseudogymnoascus destructans*).
- 7 Caves containing endemic species should be managed to emphasize protection of those species.
- 8 [Aquatic management zones](#) or best management practices should be applied to perennial, intermittent, or ephemeral streamcourses to maintain the chemical, physical, and biological conditions of connected or downstream caves, karst, and lava tubes.

### Management Approaches for Geological Features

Encourage partnerships with organizations, scientists, and outdoor recreationists to secure, preserve, and protect forest geological features and their resources.

Utilize current cave and karst management plans and guides.

Foster collaboration with the U.S. Fish and Wildlife Service, Bat Conservation International, Arizona Game and Fish Department, the National Speleological Society, and other stakeholders to address conservation, [interpretation](#), and education management for cave-dependent species and associated resources. For example, this collaboration could assist with understanding the cause and transmission of white-nose syndrome (which is not currently well understood) or with the development and implementation of cave and karst management plans.

Keep cave locations confidential except for caves that have been identified for recreational use. Cave records are managed at Forest Service locations, where they are kept secured.

Maintain a current list of significant caves on the forest and nominate new significant caves when identified. Monitor significant caves or other geological features to determine visitor impacts and the conditions of key resources.

Coordinate with partners and State and Federal agencies to both manage and monitor bat roosts to determine population dynamics.

Work with stakeholders to develop collaborative solutions to problems associated with cliff resources such as wildlife, archaeological, vegetation, and geological features.

Educate the public about the unique ecological and aesthetic value of biophysical features including safety, etiquette, disease prevention, and resource protection.

## Paleontological Resources

### General Description and Background for Paleontological Resources

Paleontological resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust that provide information about the history of life on Earth. The Coconino has a variety of paleontological resources that include: invertebrate fauna such as brachiopods, corals and mollusks; plant fossils such as ferns, horsetails and conifers; trace fossils such as arthropods and insects; vertebrate fossils such as shark teeth, camels, and reptiles; and tracks and trackways of a variety of vertebrate fauna.

### **Desired Conditions for Paleontological Resources**

#### **FW-BioPhys-Paleo-DC**

- 1** Paleontological resources are available for scientific research and limited public collection. Common invertebrate and plant paleontological resources are available for casual collecting of reasonable amounts for noncommercial personal use. Vertebrate fossils (commonly bones, bone fragments, teeth and/or tracks) and uncommon invertebrate and plant paleontological resources remain on the forest, unless collected by permit.
- 2** The scientific value of paleontological sites is preserved and sites are generally free from adverse impacts. Sites retain integrity, stability, and significance, especially sites susceptible to imminent risks or threats, or where the values are rare or unique. Visitor impacts to sites are minimal, and vandalism, theft, and human-caused damage to paleontological resources do not occur. Paleontological resources that are collected under permit and copies of associated records are preserved in an approved repository, to be made available for scientific research and public education.

### **Guidelines for Paleontological Resources**

#### **FW-BioPhys-Paleo-G**

- 1** To conserve scientific, interpretive, and legacy values, known locations of key paleontological resources (associated with geological units that contain Classes 3, 4, and 5 of the [Probable Fossil Yield Classification](#) system) should be protected from disturbance. If full protection is not feasible, effects of disturbance should be mitigated to the extent possible.
- 2** Areas may be closed or a permit may be required for casual collecting of paleontological resources to protect the resources that are being impacted by casual collecting. These areas may include, but would not be limited to, wilderness, botanical areas, geological areas, caves and karst, and research natural areas. Locality information of paleontological resources should also be protected to preserve cultural integrity and value.
- 3** Conservation and preservation efforts should be used to retain the integrity, stability, and significance of paleontological sites.

### **Management Approaches for Paleontological Resources**

Emphasize interagency coordination and collaborative efforts, where possible, with the scientific community, Federal, State, and private partners, and the general public. Work with partners such as the Museum of Northern Arizona and Northern Arizona University to protect and monitor localities.

Promote educational programs, interpretive presentations, or publications to increase public awareness of forest paleontological resources and their significance for the purpose of preservation and protection.

Conduct paleontological surveys in areas where there is high potential to encounter these resources prior to ground-disturbing activities.

Apply appropriate mitigation measures or stabilization to new or known localities.

Monitor localities-in high visitation areas such as roads, campgrounds, and trails or other areas where the likelihood of damage is high.

Retain records at Forest Service offices when they need to be accessed regularly for research purposes. Maintain electronic records, including an index of documents of historic research value.

## **Watersheds and Water**

### **General Description and Background for Watersheds and Water**

All of the watersheds in the United States are classified in a nested arrangement of hydrologic units from largest to smallest, and are identified with [hydrologic unit codes](#) (HUCs). A watershed is a delineated area or basin in which surface water collects and is funneled into larger and larger areas. The smallest delineated areas used in the Coconino NF plan are 6th code watersheds, which range in size from about 8,500 to 44,000 acres. Most of the forest's 6th code watersheds are delineated within the forest boundaries; however, some extend outside the forest boundary, resulting in portions of watersheds as small as 50 acres located within the forest boundary. Groupings of 6th code watersheds form 5th code watersheds and groupings of 5th code watersheds form 4th code watersheds, and so on. Coconino NF lies within two 3rd code watersheds, the Verde to the west and south and the Little Colorado to the east and north. Watersheds are separated from each other by a topographic feature such as a ridge, and this is called a divide.

Watersheds within the C.C. Cragin Watersheds, Inner Basin Watershed, and Lake Mary Watersheds Management Areas contribute water to public water systems.

Water quality is evaluated in terms of ADEQ State water quality standards to support [designated beneficial uses](#). Designated beneficial uses vary by stream or lake, and include aquatic and wildlife, full or partial body contact, fish consumption, domestic water source, agriculture irrigation, and agriculture livestock watering.

### **Desired Conditions for Watersheds and Water**

FW-Water-DC

- 1 Watersheds are functioning properly and are resilient to natural and human disturbances.
- 2 Watersheds exhibit high [geomorphic](#), hydrologic, and biotic integrity within their inherent capability. Natural hydrologic, hydraulic, geomorphic, and biologic processes function at a level that allows retention of their unique physical and biological properties to maintain or improve downstream water quality.
- 3 Vegetation and soil conditions in watersheds support important ecosystem services such as clean water, base flow, riparian communities, and long-term soil productivity. These conditions also help moderate climate variability and change. Soil and vegetation function to facilitate precipitation infiltration and groundwater recharge.
- 4 Watersheds exhibit a high degree of connectivity along streams, laterally across the [floodplains](#) and valley bottoms and vertically between surface and subsurface flows. Streamcourses and other links between aquatic and upland components provide access to food, water, cover, nesting areas, and protected pathways for aquatic and upland species.

- 5 Water quantity (base flows) of intermittent and perennial streams are sustained to mimic seasonal flow regimes. Peak flows and flood potential occur within the historic range of variability for that stream system. For baseflows, this means that during low-flow periods (fall and winter, generally), water flow is sustained within its natural capability.
- 6 Water quality, water quantity and the timing of water flows support ecological functions, habitat for aquatic and riparian species, and water sources for municipalities. Water quality, water quantity, and the timing of flows are sustained at levels that retain the biological, physical, and chemical integrity of associated systems and benefit survival, growth, reproduction, and migration of native species.
- 7 Water quality meets or exceeds Arizona water quality standards and supports identified designated beneficial uses.

### **Guidelines for Watersheds and Water**

#### **FW-Water-G**

- 1 Watersheds should have enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long-term soil productivity.
- 2 Watershed restoration and maintenance, and vegetation treatments should focus on priority 6th code watersheds to ensure that ecosystem processes, resilient vegetation conditions, and natural disturbance regimes are functioning properly.
- 3 Instream flow water rights should be procured for those streams without instream water rights to ensure that sufficient flow is provided for aquatic species, habitat, and recreation.
- 4 Best management practices for management activities should be identified, implemented, and monitored to maintain water quality, quantity, and timing of flows, and to prevent or reduce accelerated erosion.
- 5 For [impaired waters](#) or non-attaining waters, approved [total maximum daily load \(TMDL\)](#) recommendations or implementation plans should be implemented to maintain or improve water quality to meet or exceed Arizona water quality standards and support identified designated beneficial uses.
- 6 Within existing water rights, excess water should remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat.

### **Management Approaches for Watersheds and Water**

Coordinate with the Rocky Mountain Research Station, U.S. Geological Survey and other research organizations on long-term and landscape studies of watershed function.

To enhance the protection of human health and safety, consider watershed treatments such as vegetation thinning, prescribed burning, and channel stabilization where protection of people, structures, and community infrastructure (such as roads, bridges, power corridors, and water supply) in and associated with the [wildland-urban interface \(WUI\)](#) are at risk.

Consider prioritizing and accelerating watershed treatments such as vegetation thinning, prescribed burning, and channel stabilization in C.C. Cragin Watersheds MA, Lake Mary Watersheds MA, and Inner Basin Watershed MA to help reduce the threat of crown fires, flood volumes, sedimentation impacts, and risk of future wildfires.

File for water rights on appropriable waters following State procedures. Complete all documentation required for the adjudication process in the Little Colorado and Gila River (Verde watershed) specified by the courts.

Prioritize streams for water right filing based on risk of diversion and subsequent onsite loss of water, and habitat for threatened and endangered aquatic species. Complete required stream gaging and file applications on priority streams. Gaging, filing, and any associated adjudication are completed as budgets allow.

Participate in State water rights adjudications and settlement discussions for negotiating water rights settlements outside of extended adjudication.

Secure water rights through purchase or severance and transfer when additional sources are needed.

Consider water rights during project planning and implementation.

Maintain and annually update an inventory of all water rights on the forest.

Provide input and recommend strategies for implementation plans as required by Arizona Revised Statute 49-234 for existing TMDLs to provide strategies to reduce existing pollutant loads identified in TMDLs, and to be in compliance with applicable water quality standards for impaired waters.

Collaborate with volunteers, other agencies, private landowners, and other stakeholders on education, interpretation, and monitoring relating to water quality, public health, and fish and wildlife habitat especially in regard to threats to water quality from leaking septic tank systems; threats to water supply and water quality from wildfires; threats to downstream resources from the use of fertilizers; and threats to health and resources from improper disposal of diapers and other garbage or when State water quality standards have been exceeded.

Use table 1 as a general starting point for determining the width of the aquatic management zone relative to erosion hazard. Aquatic management zones may be wider or narrow than suggested in table 1 and would be decided at the project level. Considerations for the size and shape of an aquatic management zone include amount and type of material on the ground, width and slope of the zone, soil type or hydrologic soil group, orientation of stream or river to the Sun, connection of stream to impaired or non-attaining waters, presence of threatened or endangered species, condition of the riparian area, adjacent land use, and threat of contamination from pollutants or chemicals. Significant topographic changes, such as abrupt canyon edges may be used as boundaries for aquatic management zones, as long as activities beyond the canyon walls do not negatively influence the functioning of the aquatic management zone.

Develop and maintain relationships with stakeholders on water rights issues. Coordinate and work with stakeholders toward maintaining and improving riparian attributes.

Coordinate with Federal, State, and county organizations and interested stakeholders with respect to groundwater and surface water issues including preservation, water quantity, and timing of flows.

## **Constructed Waters**

### **General Description and Background for Constructed Waters**

Constructed waters include reservoirs, earthen stock ponds, and wildlife drinkers that have been created through one or a combination of dams, dikes, diversions, berms, excavation, or other human-made structures or activities.

Reservoirs are permanent open water sources on the Forest and are annually recharged through flooding and precipitation. There are 14 reservoirs on the Coconino NF, which include Ashurst Lake, C.C. Cragin Reservoir, Coconino Dam, Knoll Lake, Kinnikinick Lake, Long Lake, Lower Lake Mary, Morton Lake, Mud Lake, Odell Lake, Soldier Lake, Soldier Annex, Tremaine Lake, and Upper Lake Mary. Reservoirs are characterized by submergent vegetation (grows beneath the surface of the water) and a relatively high proportion of bare soils around the shoreline.

Earthen stock ponds are small water impoundments that provide water for livestock and wildlife.

Wildlife drinkers, or wildlife guzzlers, are water sources that usually consist of a metal apron to collect water in a storage tank that is connected to a water trough.

Constructed waters provide recreation opportunities such as hunting, fishing, camping, boating and other water-related sports and have value for wildlife and livestock.

### **Desired Conditions for Constructed Waters**

FW-ConstWat-DC

- 1 Constructed waters provide water for a variety of uses, depending on the water rights. These uses may include water for municipal use, recreation, livestock, and wildlife.
- 2 Earthen stock ponds and wildlife waters are accessible to wildlife, especially during key periods such as pronghorn fawning or during times of stress such as drought.

### **Guidelines for Constructed Waters**

FW-ConstWat-G

- 1 For new projects and management activities, a site-specific aquatic management zone should be identified and maintained around reservoirs to protect water quality and to avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions or aquatic habitat. Soil and vegetation disturbance from management activities should be minimized to meet this intent, but is not necessarily excluded in this zone.
- 2 Earthen stock ponds determined to be important for threatened, endangered, and Southwestern Region sensitive species, should be managed to maintain water and habitat needed for species' survival and reproduction, consistent with existing water rights.

## Riparian Areas

### All Riparian Areas

#### General Description and Background for All Riparian Areas

Riparian areas are associated with perennial and intermittent streams, lakes, wetlands, and springs and their associated riparian vegetation zone. A riparian vegetation zone is the interface between terrestrial uplands and water. Water-dependent plants near the water often transition to a combination of upland and riparian species as distance from water increases.

These biologically diverse areas:

- are more productive per acre in biomass of plants and animals than other vegetation communities;
- dissipate the energy of flood flows and help maintain water table elevations;
- influence water quality by protecting streams from excessive sedimentation, erosion, and pollution;
- play a key role in nutrient and water storage and distribution;
- create shade that helps regulate soil and water temperature;
- provide shelter and food for aquatic animals; and
- function as wildlife habitat and [movement corridors](#) so species can move along aquatic and riparian zones with minimal isolation and fragmentation.

Where potential exists, riparian area vegetation includes native aquatic plants, aquatic [macrophytes](#), [aquatic emergents](#), grasses and sedges, forbs, shrubs, and deciduous trees.

Structural diversity in riparian areas is provided by aquatic vegetation; leaf litter; ground cover, understory, mid-story, [overstory](#), dead and live trees; and dead and down woody material.

Plan direction for reservoirs and some lakes that have dams is located in the section for Constructed Waters. Plan direction for lakes without dams is located under All Riparian and Wetlands.

#### Desired Conditions for All Riparian Areas

##### FW-Rip-All-DC

- 1 Within their type and capability, riparian ecosystems and corridors promote the natural role of water, natural hydrogeomorphic processes, sediment movement and capture, woody debris recruitment and retention, and root masses, and maintain water tables. This includes perennial and intermittent riparian streamcourses. The associated water table supports riparian vegetation.
- 2 Instream flows provide for channel and floodplain maintenance, recharge of alluvial aquifers, water quality, and temperature fluctuations within the natural range of variability.
- 3 Riparian areas exhibit connectivity between and within aquatic, riparian and upland components that reflects their natural range of variability and linkages. Naturally isolated springs remain isolated. Riparian areas are connected vertically between surface and

subsurface flows. Streamcourses and other links between aquatic and upland components support ecological functions, and provide habitat and movement corridors for aquatic and upland species.

- 4 Riparian areas are managed consistent with designated beneficial uses associated with existing claimed or certified water rights. Water quality is maintained or improved so it fully supports State water quality standards or designated beneficial uses identified by ADEQ.
- 5 Where the potential exists, vegetation, root masses, and woody debris stabilize and protect banks, edges, and shorelines of riparian areas from disturbances. Plant distribution and occurrence are resilient to natural disturbances.

### **Guidelines for All Riparian Areas**

#### **FW-Rip-All-G**

- 1 Management activities such as vegetation treatments or other restoration actions should be designed to maintain or move toward desired conditions for soil, riparian vegetation, and water quality.
- 2 Riparian areas should be managed to promote natural movement of water and sediment, to maintain ecological functions, and to maintain habitat and corridors for species.
- 3 An aquatic management zone should be identified and maintained in riparian areas to protect water quality and to avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions, habitats for aquatic species, or connected downstream cave, karst, and lava tube resources. Soil and vegetation disturbance from management activities should be managed to meet these intents, but is not necessarily excluded in this zone. The general starting points for widths of aquatic management zones are shown in table 1.

**Table 1. General starting points for aquatic management zones in riparian areas**

<b>Erosion Hazard</b>	<b>Width of Zone in Riparian Areas</b>
Severe	150 feet each side of streamcourse or riparian area
Moderate	125 feet each side of streamcourse or riparian area
Slight	100 feet each side of streamcourse or riparian area

### **Management Approaches for All Riparian Areas**

Consider table 1 as a general starting point for determining the width of the aquatic management zone relative to erosion hazard. Aquatic management zones may be wider or narrow than suggested in table 1, and would be decided at the project level. Considerations for the size and shape of an aquatic management zone include amount and type of material on the ground, width and slope of the zone, soil type or hydrologic soil group, orientation of stream or river to the Sun, connection of stream to impaired or non-attaining waters, presence of threatened or endangered species, condition of the riparian area, adjacent land use, and threat of contamination from pollutants or chemicals. Significant topographic changes, such as abrupt canyon edges may be used as boundaries for aquatic management zones, as long as activities beyond the canyon walls do not negatively influence the functioning of the aquatic management zone.



## Stream Ecosystems

### General Description and Background for Stream Ecosystems

On the Coconino NF, there are three types of streamcourses: ephemeral, intermittent, and perennial. They differ in the timing and duration of waterflow and corresponding vegetation. Ephemeral streamcourses flow short term in response to storm events and lack riparian vegetation. Intermittent streamcourses flow seasonally, usually in response to snowmelt. Some intermittent streamcourses support riparian vegetation and some do not. Perennial streamcourses flow year-round except during extended drought, and some of their flows may be below the surface. Perennial streamcourses support riparian vegetation. Streamcourses include their associated floodplains. On the Coconino NF, most streams are located on the southern and western portions of the forest. Sinking streams are also addressed in the section on Geological Features.

Stream ecosystems collect and transport water, sediment, and organic material from upslope, upstream, and across floodplains during moderate flood events. Primary natural disturbances in stream ecosystems include flooding, adjacent landslides, and changing climatic conditions, such as extended drought. The seasonality and quantity of water in floods are key factors in the germination and establishment of riparian vegetation. Fire is an infrequent disturbance and is dependent on the [fire regime](#) in adjacent vegetation communities.

Stream ecosystems include rivers, creeks, and streams, and their associated riparian vegetation zones. There are microhabitats such as riffles, pools, and backwaters. Plants, animals, and micro-organisms are specialized to live in and around flowing water.

### Desired Conditions for Stream Ecosystems

FW-Rip-Strm-DC

- 1 Perennial and intermittent riparian streamcourses maintain their natural sinuosity and have access to their floodplains so that when floods do occur, energy can be dissipated without causing damage to the streambanks of the channel. Stream channel stability is maintained or restored.
- 2 Flooding is the primary natural disturbance in perennial, intermittent, and ephemeral streamcourses. In some streamcourses, flooding creates a mix of stream substrates for fish habitat, and sites for germination and establishment of riparian vegetation.
- 3 Perennial and intermittent riparian streamcourses, and associated floodplains, are capable of filtering sediment, capturing and/or transporting [bedload](#), aiding floodplain development, improving floodwater retention, improving or maintaining water quality, and providing groundwater recharge within their natural potential.
- 4 Streams maintain a natural hydrograph, or waterflow over time, including periodic flooding, which promotes natural movement of water, sediment, nutrients, and woody debris.

## Guidelines for Stream Ecosystems

### FW-Rip-Strm-G

- 1 In perennial and intermittent riparian streamcourses, projects and management activities should be designed and implemented to retain or restore natural streambank stability, native vegetation, and riparian and soil function.
- 2 An aquatic management zone for non-riparian, intermittent streamcourses should be identified and maintained to reduce sedimentation, maintain functioning of the channel within its floodplain, and maintain downstream water quality and riparian habitat and function. This management zone would also avoid detrimental changes in water temperature or chemical composition; blockages of streamcourses; or sediment deposits that would seriously and adversely affect water conditions, fish habitat, or connected downstream cave, karst, and lava tube resources. Soil and vegetation disturbance from management activities should be managed to meet these intents, but is not necessarily excluded in this zone. The general starting points for widths of aquatic management zones are shown in table 2.

**Table 2. General starting points for aquatic management zones in nonriparian intermittent streamcourses**

<b>Erosion Hazard</b>	<b>Width of Zone in Nonriparian Intermittent Streamcourses</b>
Severe	100 feet each side of streamcourse
Moderate	70 feet each side of streamcourse
Slight	35 feet each side of streamcourse

## Management Approaches for Stream Ecosystems

Consider table 2 as a general starting point for determining the width of the aquatic management zone relative to erosion hazard. Aquatic management zones may be wider or narrow than suggested in table 2, and would be decided at the project level. Depending on downstream water quality issues, ephemeral streamcourses may be identified and protected at the project level. Considerations for the size and shape of an aquatic management zone include amount and type of material on the ground, width and slope of the zone, soil type or hydrologic soil group, orientation of stream or river to the Sun, connection of stream to impaired or non-attaining waters, presence of threatened or endangered species, condition of the riparian area, adjacent land use, and threat of contamination from pollutants or chemicals. Significant topographic changes, such as abrupt canyon edges may be used as boundaries for aquatic management zones, as long as activities beyond the canyon walls do not negatively influence the functioning of the aquatic management zone.

Coordinate with local, State, private, and other Federal agencies to make sure natural streamcourses are maintained and not fragmented by development.

Coordinate with the ADEQ to monitor and achieve acceptable total maximum daily loads (TMDLs) [suspended sediment concentration](#) in the Verde River.

## Wetlands

### General Description and Background for Wetlands

Wetlands are areas that are inundated by surface or groundwater with a frequency to support, and that under normal circumstances, do or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetlands generally include marshes, potholes, wet meadows, and natural ponds on the Coconino NF. Earthen stock ponds located outside wetlands are addressed in the section on Constructed Waters rather than the section under Wetlands.

Standing water and vegetation in wetlands can fluctuate from being nonexistent in dry periods to being abundant in wet periods. Hydric soils, decomposition, nutrient cycling and geomorphic setting contribute to unique vegetation components and functioning wetlands.

Wetland types differ in water permanency, vegetation, and flooding frequency. The wetland types are semi-permanent, seasonal, temporary, or ephemeral wetlands (table 3).

**Table 3. Wetland type characteristics**

Wetland Type	Water Permanency/ Flooding Regime <sup>1</sup>	Characteristic Plant Species Occupying Deepest Zone	Flooding Frequency
Semi-permanent	6–12 months	Hardstem bulrush, cattail; submerged aquatics	>7 of 10 years
Seasonal	3–6 months	Manna grass, spikerush, sedges.	<7 of 10 years
Temporary	1–2 months	Alpine timothy, Foxtail barley	3 of 10 years
Ephemeral	2–6 weeks	Bare soil, dock, western wheatgrass, deergrass	<3 of 10 years

<sup>1</sup> Flooding regime relates to the timing, spatial extent, depth, and response to runoff associated with the overflowing of water from the normal confines of a stream or other body of water.

Primary natural wetland disturbances are drought and flooding. Natural fire is an infrequent disturbance, entering from adjacent vegetation communities mainly during drought conditions. Human-related disturbances include excessive herbivory, improperly located roads, off-road vehicle use, recreation, and invasive species. Some of these human-related disturbances can result in the channelization and draining of wetlands and/or the lowering of water tables, which can lead to the loss of wetlands.

On the Coconino NF, numerous semi-permanent to ephemeral wetlands and permanent lakes occur south of Flagstaff. They range in size from Mormon Lake at about 5,500 acres to smaller wetlands less than 10 acres in size.

### Desired Conditions for Wetlands

#### FW-Rip-Wtlns-DC

- 1 Wetlands provide functional soil and water resources on most acres, consistent with their flood regime and flood potential, and provide diverse habitats for native species. Wetlands are in or trending toward [proper functioning condition](#).
- 2 Consistent with the natural hydrologic cycle, wetland vegetation has a variety of [age classes](#) ranging from young to old and a composition of [native species](#) that reflects the individual

wetland types. Plant composition can vary considerably at the fine- and mid-scales depending on site potential (as determined by TEUI or other appropriate ecological classification system) and geomorphology, elevation, climate, topography, soils, and smaller scale disturbances. Wetlands include vegetation that indicates maintenance of riparian soil moisture characteristics (plants that occupy the deepest zones in table 3).

### Objectives for Wetlands

#### FW-Rip-Wtlands-O

- 1 Restore 5 to 10 wetlands currently not in proper functioning condition so that they are in, or are trending toward, proper functioning condition during each 10-year period over the life of the plan.

### Management Approaches for Wetlands

Coordinate with stakeholders on water management, recreation, private land issues, etc.

Coordinate with the U.S. Fish and Wildlife Service (USFWS) and Arizona Department of Game and Fish on the management of wetlands, lakes, and protection measures for species.

## Springs

### General Description and Background for Springs

Springs are surface-linked ecosystems where groundwater reaches and usually flows from the Earth's surface in complex, and sometimes lengthy, flow paths through subsurface structural, geochemical, and geomorphic environments. Springs function as keystone ecosystems that have disproportional impacts on ecology, biodiversity, economics, and culture in relationship to their size. Springs often function as isolated islands of habitat and many serve as paleoreugia, that is, long-term stable habitats in which the evolutionary processes of natural selection, isolation, and adaptation (sometimes to extreme environmental conditions) result in restricted or endemic species, such as snails, plants, and invertebrates (Stevens and Meretsky 2008).

There are 10 spring types among the more than 300 springs distributed throughout the Coconino NF (table 4). Springs may be intermittent or perennial. Not all springs have hydric soils because soil development depends on the type of spring discharge. Also, proximity does not always indicate that one spring is similar to an adjacent one. Spring vegetation can include algae, aquatic plants, and riparian-dependent grasses, forbs, sedges, shrubs, and deciduous trees. Springs may be used for domestic use, and by wildlife and/or livestock.

All springs are significant to tribes who have traditionally used lands within the Coconino NF.

**Table 4. Spring types**

Spring Type	Hydrogeology
Cave	Emergence in a cave
Exposure	Groundwater exposed at the land surface but does not flow
Gushet	Discrete source flow gushes from a wall
Hanging garden	Dripping flow emerges usually horizontally along a geologic contact along a cliff

Spring Type	Hydrogeology
Helocrene (marsh) or <a href="#">ciénega</a> (wet meadow)	Low-gradient wetlands; often indistinct or multiple sources; typically originating from a spring
Hillslope	Emerges from a hillslope (30 to 60 degree slope); often indistinct or multiple sources.
Hypocrene	A buried spring where flow does not reach the surface.
Limnocrene	Emergence in pool(s)
Mound-form	Emerges from a mineralized mound. Carbonate.
Rheocrene – lotic channel floor	Flowing spring, emerges directly into one or more stream channels

### Desired Conditions for Springs

#### FW-Rip-Spr-DC

- 1 Springs have functional soil, water, and vegetative resources consistent with natural waterflow patterns, recharge rates, and geochemistry appropriate for the site.
- 2 Spring vegetation has young, mid, and late [seral stages](#) and a composition of native aquatic and riparian species consistent with spring type, slope, aspect, natural disturbances, and natural solar energy budget (amount of radiation during different times of the year<sup>5</sup>).
- 3 Spring riparian zones are capable of filtering sediment, capturing and/or transporting bedload, improving or maintaining water quality, providing groundwater recharge and supporting perched water-bearing zones within their natural potential, consistent with the spring type.
- 4 Consistent with existing [water rights and claims](#), springs are rarely developed and altered by human-made structures such as head boxes, cisterns, and pipelines.
- 5 The physical and biological components of springs provide habitat for [narrowly endemic](#) species and those with [restricted distributions](#).

### Objectives for Springs

#### FW-Rip-Spr-O

- 1 Restore riparian function to at least 25 springs identified as not in proper functioning condition to provide water quantity and aquatic habitat for the recovery of plant and animal species during each 10-year period during the life of the plan.

### Guidelines for Springs

#### FW-Rip-Spr-G

- 1 Spring recharge areas, where known, should be managed to maintain or improve spring discharge.
- 2 Water rights should be maintained or procured to protect in situ (onsite) water quantity where no water rights exist.

<sup>5</sup> The number of species and the number of endemic species are correlated with solar energy.

- 3 Projects and activities should be designed and implemented to maintain or improve soil and riparian function; maintain or improve native vegetation; and/or prevent the introduction or spread of disease, invasive, or undesirable species. Design features could include road, recreation, and/or livestock management.
- 4 Where there is a structure in place to use water from a spring as a water source or when designing restoration projects, priority should be given to the protection of spring source areas and riparian habitat to safeguard the unique ecological and biophysical characteristics, higher biodiversity, endemic species, and cultural values associated with spring sources. For example, water could be piped out of the riparian area to avoid negative impacts to soil, water, and vegetation or if water is to be diverted, a flow-splitter could be installed to maintain some flow at the source.

### Management Approaches for Springs

Continue working with partners and stakeholders, including tribes, to inventory, classify, assess, and prioritize springs and recharge areas for restoration, and to implement restoration activities. Include consideration of rare species and endemic species when evaluating springs for restoration.

### Riparian Forest Types

See appendix A, map 5.

### General Description and Background for Riparian Forest Types

Riparian forests on the Coconino NF are classified into three broad groups: Cottonwood Willow Riparian Forest (Cottonwood Willow), Mixed Broadleaf Deciduous Riparian Forest (Mixed Broadleaf), and Montane Willow Riparian Forest (Montane Willow). Each riparian forest type consists of one or more riparian ERUs (see the crosswalk of riparian forest types to Riparian ERUs in Appendix E). Primary natural disturbances in riparian forest ecosystems include flooding, adjacent landslides, and changing climatic conditions, such as extended drought or extreme temperatures, not fire.

Table 5 provides the relative proportion of riparian forest types on the Coconino NF. It also shows the percentage of plants known to be used by tribes that traditionally use the forest. For example, 18 percent of the plants known to be used by tribes occur within Cottonwood Willow. This is intended to show the relative importance of a riparian forest type for culturally important plants. Some plant species are found in multiple riparian forest types and in terrestrial ERUs. In addition to the information in table 5, use of 4 percent of the forest plants traditionally used by tribes occurs in water.

**Table 5. Proportion of riparian forest types on Coconino NF with percentage of culturally important plants**

Riparian Forest Types and Water	Proportion Within the Lands Managed by Coconino NF	Percentage of Plants Known to be Used by Tribes that Traditionally Use the Forest
Cottonwood Willow	0.1	18
Mixed Broadleaf	0.3	27
Montane Willow	0.2	8

[Mesquite bosques](#) are parklike stands of mesquite trees that occur on floodplain terraces above stream channels. Generally, larger form mesquite trees occur where mesquites can access groundwater. Canopies are connected and the understory is fairly open. Flooding and climatic changes are the primary natural disturbances. The combination of mesquite bosques along with lower elevation riparian forests creates a unique vegetation community for an assemblage of wildlife species.

Mesquite bosques occur on floodplain terraces above stream channels and are associated with Cottonwood Willow or Mixed Broadleaf riparian forest types. Generally, larger form mesquite trees occur where mesquites can access groundwater. Canopies are connected and the understory is fairly open. Flooding and climatic changes are the primary natural disturbances.

Mesquite bosques occur along the Verde River and its tributaries including (from north to south): Sycamore Creek, Spring Creek, Oak Creek, Dry Beaver Creek, Beaver Creek, Red Tank Draw, Walker Creek, West Clear Creek, Sycamore Spring, and Fossil Creek.

Mesquite bosques are threatened by groundwater pumping, surface water diversion, land clearing, wood cutting, and livestock grazing. Many mesquite bosques on private land no longer exist because they have been converted for agriculture, subdivision, and infrastructure. On the Coconino, infrastructure such as roads and recreation sites have fragmented mesquite bosques and many have been affected by stream down-cutting and channelization and the resulting lowered water tables.

#### **Cottonwood Willow Riparian Forest**

Cottonwood Willow Riparian Forest covers about 1,324 acres of the Coconino NF. It occurs in [patches](#) distributed along the lower gradient reaches of perennial streams including the Verde River, Oak Creek, West Clear Creek, Wet Beaver Creek, Dry Beaver Creek, Sycamore Creek, and Fossil Creek as well as other perennial and intermittent streams and tributaries.

Dominant vegetation includes: Fremont cottonwood, willow, ash, box elder, alder, and others. Various grasses and forbs are usually present. Associated higher stream terraces support a mix of riparian and upland vegetation, including mesquite and desert willow. Floodplains tend to have greater vegetation productivity (biomass) than terraces. Consequently, floodplains have greater ability to resist erosion and recycle nutrients.

Cottonwood Willow is adjacent to Cottonwood, Camp Verde, Cornville and other communities in the broader valley floodplains along the Verde River and confluences of its major tributaries. Much of this ERU along the Verde River, lower Oak Creek and lower Wet Beaver Creek is privately owned or managed by Arizona State Parks. Water diversions and increasing human development in the watersheds have affected quantity and seasonality of historical flood regimes.

#### **Mixed Broadleaf Deciduous Riparian Forest**

Mixed Broadleaf Deciduous Riparian Forest covers approximately 5,926 acres of the Coconino NF. It occurs in patches distributed across mid-elevation portions of Sycamore Canyon, West Clear Creek, Oak Creek, Beaver Creek, Fossil Creek and associated tributaries. It is adjacent to the communities of Sedona and Village of Oak Creek.

Mixed Broadleaf consists of a vegetation mix of riparian woodlands and shrublands with various dominant species, depending on site-specific characteristics. Vegetation can include: Arizona

sycamore, thin leaf alder, willow, conifers, box elder, narrow leaf or Fremont cottonwoods, velvet ash, Arizona walnut, and often contains oaks and conifers, including Arizona cypress, from adjacent uplands. Soil productivity is inherently low on terraces and higher along floodplains.

#### **Montane Willow Riparian Forest**

Montane Willow Riparian Forest covers approximately 3,568 acres of the Coconino NF. This ERU is patchily distributed along perennial water at higher elevations such as East Clear Creek and its tributaries; seasonally intermittent streams; wet meadows; and isolated springs.

Trees include: Bebb's willow, narrowleaf cottonwood, velvet ash, cherry, box elder, Arizona walnut, and Arizona alder. Dominant shrubs include red osier dogwood, willows, and woods rose. The understory consists of a variety of grass and grasslike species, including sedge, Baltic rush, spikerush, and deergrass. Outlying populations of this ERU may have unique genetic components. Soil productivity is moderate to high on terraces and higher along floodplains.

#### **Desired Conditions for Riparian Forest Types**

##### **FW-Rip-RipType-DC**

- 1 Riparian forests are functioning or in good condition and contribute to healthy watersheds while providing for multiple uses. Periodic flooding and scouring are the primary natural disturbances and promote a diverse plant structure consisting of herbaceous, shrub, and tree species of all ages and size classes necessary for the recruitment and succession of riparian-dependent species. Age and size classes include seedling, sapling, mature, and overmature vegetation. Fire is infrequent and of low burn severity when it occurs.
- 2 Riparian forests and their channels and adjacent flood plains are capable of filtering sediments, ash, and contaminants; building and stabilizing banks; reducing the effects of flooding; storing and releasing water; cycling nutrients, and recharging aquifers to support basic functioning and resilience. Riparian forests provide habitat and help maintain temperatures necessary for maintaining populations of native aquatic and riparian-dependent species and for their dispersal. At the landscape scale, overall plant composition similarity to [site potential](#) averages greater than 66 percent. Plant composition and spatial arrangement can vary considerably at the fine- and mid-scales because of diverse seral conditions, depending on site potential (as determined by TEUI or other appropriate ecological classification system) and climate, elevation, geomorphology, topography, soils, and smaller scale disturbances.
- 3 Protective litter and plant cover is similar to site potential (greater than 66 percent) which allows higher stream terraces and floodplains to recycle nutrients, and resist erosion and compaction. The amounts of litter and cover can vary considerably at the fine- and mid-scales, depending on site potential (as determined by TEUI or other appropriate ecological classification system).
- 4 Root masses and herbaceous vegetation stabilize banks, filter sediment, and maintain or improve water quality.
- 5 Dead ([snags](#)) and live trees, and down woody material provide prey base habitat, aquatic nutrient cycling, and soil retention.
- 6 Collectively, lower elevation riparian forests and mesquite bosques provide a unique vegetation community favored by bird species such as the western yellow-billed cuckoo and



Bell's vireo. When water tables are high, mesquite bosques persist on upland terraces. In mesquite bosques, a variety of age classes are present, including seedling, sapling, mature, and overmature trees. The understory is comprised of native grasses and forbs.

### **Objectives for Riparian Forest Types**

#### **FW-Rip-RipType-O**

- 1 Restore the function of 200 to 500 acres of nonfunctioning and functioning-at-risk riparian areas during each 10-year period over the life of the plan, with emphasis on priority 6th code watersheds, so that they are in or moving toward proper functioning condition.

### **Guidelines for Riparian Forest Types**

#### **FW-Rip-RipType-G**

- 1 Water diversions and groundwater pumping should not lower the water table to prevent loss of or undesired changes to composition, structure, or function to riparian forests or mesquite bosques.
- 2 Connectivity within the unique vegetation community created by the combination of lower elevation riparian forests, and mesquite bosques should be maintained and enhanced. The intent is to maintain ecological functions, tree density, and growth, native understory, and reduce the risk of predation and nest parasitism and to provide habitat for western yellow-billed cuckoo, Bell's vireo, and other wildlife species.
- 3 In riparian forests, recreation activities, permitted uses, and management activities should occur at levels that maintain or allow improvement of soil function, riparian vegetation, and water quality at the stream reach scale. This guideline would not apply to fine-scale activities and facilities such as intermittent livestock crossing locations, [water gaps](#), or other infrastructure used to manage impacts to riparian areas at a larger scale.
- 4 Fire wood cutting or wood removal should be managed in remaining mesquite bosques to avoid impacts to understory species, tree density, tree growth, and to avoid channel downcutting and accelerated erosion.

### **Management Approaches for Riparian Forest Types**

As opportunities arise, consider the relocation or modification of existing developments and infrastructure where appropriate to reduce fragmentation of the unique vegetation community of lower elevation riparian forests and mesquite bosques.

## **Terrestrial ERUs**

### **All Terrestrial ERUs**

See appendix A, map 4.

### **General Description and Background for All Terrestrial ERUs**

Plan components for terrestrial ecosystems are grouped by ecological response units (ERUs). ERUs represent an ecosystem stratification based on vegetation characteristics that would occur

when natural disturbance regimes and biological processes prevail, and combine potential vegetation and historic fire regimes to form ecosystem classes useful for landscape assessment (USDA Forest Service 2014).

Terrestrial ERUs include forest, woodlands, shrublands, and grasslands. Riparian ecosystems are described under Riparian Areas. One factor that distinguishes grasslands from forest and woodland ERUs is canopy cover. In the plan, grasslands are those areas that have less than 10 percent canopy cover of overstory species and forest, and woodland ERUs have 10 percent or greater canopy cover.

Table 6 provides the relative proportion of terrestrial ERUs on the Coconino NF. It also shows the percentage of plants known to be used by tribes that traditionally use the Forest. For example, 57 percent of the plants known to be used by tribes occur within Desert Communities ERU. This is intended to show the relative importance of an ERU for culturally important plants. These percentages exceed 100 percent because some plant species are found in multiple ERUs.

**Table 6. Proportion of terrestrial ecological response units on Coconino NF with percentage of culturally important plants by ERU**

Ecological Response Unit	Proportion Within the Lands Managed by Coconino NF	Percentage of Plants Known to be Used by Tribes that Traditionally Use the Forest
Desert Communities	3.4	57
Semi-desert Grassland	4.9	35
Great Basin Grassland	5.0	12
Montane/Subalpine Grassland	1.3	
Interior Chaparral	2.7	24
Pinyon Juniper Evergreen Shrub	14.3	63
Pinyon Juniper Woodland	4.1	
Pinyon Juniper with Grass	14.2	
Ponderosa Pine	43.3	64
Mixed Conifer with Frequent Fire	2.7	67
Mixed Conifer with Infrequent Fire	2.0	
Spruce Fir Forest	0.8	9
Alpine or Tundra	0.1	1

Desired conditions for Grassland, Ponderosa Pine, Mixed Conifer, and Spruce-Fir ERUs are described at three spatial scales: landscape scale (1,000 to 10,000 acres+), mid-scale (10 to 999 acres), and fine-scale (less than 10 acres). Vegetation descriptions at these multiple, nested scales are intended to provide adequate detail and guidance for designing projects and activities that help achieve the desired conditions over time. Descriptions of landscape scale desired conditions provide the “big picture” desired conditions for terrestrial resources across the larger land area. Desired condition descriptions at the mid-scale and fine-scale provide further details necessary for guiding future site-specific projects and activities. The landscape scale is typically composed of variable elevations, slopes, aspects, soils, plant associations, and disturbance processes. Ten or more mid-scale units comprise a landscape area. The mid-scale is composed of assemblages of fine-scale units that have similar biophysical conditions. The fine-scale is an area in which the species composition, age, structure, and distribution of plants (single, grouped, or

aggregates of groups) are described. The remaining ERUs have desired conditions without multiple scales, because most of the information available was not scale-specific.

Ranges (minimum, maximum) of values presented in desired conditions were informed by current science for natural variation in the composition and structure within an ERU, and adjusted by social/economic desires and management experience (USDA Forest Service 2014). Desired conditions vary within an ERU due to spatial variability in soils, elevation, or aspect, and to provide managerial flexibility to meet local project objectives. The ranges often represent the upper and lower extremes for a given variable (such as the lowest and highest tree densities in a vegetation type). It is important to recognize that the goal is that most acres would be managed towards the median of the range, but representation across the range is equally desired. However, it may be appropriate to have different desired conditions within a vegetation type, such as a lower density of vegetation in the WUI than outside of the WUI to achieve the desired fire behavior near property and human occupancy.

This section also includes plan direction on stringers, which are noncontiguous, narrow communities of an ERU that extend into lower elevation ERUs, usually along drainages. Stringers provide connectivity between vegetation communities and add to ecological diversity by supporting different structure, composition, and microclimates compared to lower elevation environments.

In addition, this section includes plan direction for aspen and maple. Aspen and maple are components of ERUs, but are not considered ERUs in and of themselves, or distinct vegetation communities on the Coconino NF, because they typically exist as smaller stands within a larger forest matrix dominated by mixed conifer vegetation. Aspen also exists within spruce-fir, ponderosa pine, and occasionally, riparian vegetation. Plan direction has been developed specifically for aspen and maple because of their contributions to scenic integrity and biodiversity on the forest.

### **Desired Conditions for All Terrestrial ERUs**

#### **FW-TerrERU-All-DC**

- 1 Each ERU contains a [mosaic](#) of vegetation conditions, densities, and structures. This mosaic occurs at a variety of scales across landscapes and watersheds, and reflects the natural disturbance regimes affecting the area.
- 2 Within their type and capability, terrestrial ERUs are functioning properly and are resilient to the frequency, extent, intensity, and severity of disturbances, such as fire in fire-adapted systems, and adapt to climate variability. Natural and human disturbances provide desired overall plant density, species composition (mix of species), [structure](#), [coarse woody debris](#), and nutrient cycling. Desired disturbance regimes, including fire, are restored where practical.
- 3 Vegetation and stream ecosystems are connected based on natural patterns that are consistent with landforms and topography and provide for upland and aquatic species movements and genetic exchange.
- 4 Vegetation conditions allow for [inclusions](#) and variability within the landscape as well as for transition zones or [ecotones](#) between riparian areas, forests, woodlands, shrublands, and grasslands. Transition zones shift in time and space due to factors affecting site conditions

(such as fire or climate). Stringers persist where they naturally occur. For example, pine stringers are noncontiguous narrow communities of pine (often large old trees) that extend into lower elevation vegetation.

- 5 Vegetation provides ecologically sustainable amounts of products, such as wood fiber or forage.

### **Standards for All Terrestrial ERUs**

#### **FW-TerrERU-All-S**

- 1 When [openings](#) are created with the intent of regeneration, efforts shall be made to ensure that lands can be adequately restocked within 5 years of final harvest.
- 2 Cutting methods designed to establish an [even-aged stand](#) of timber may be used only where it is determined by interdisciplinary review to be appropriate to meet the desired conditions (see Terrestrial ERUs - Management Approaches). Typically, these methods would only be planned when it is needed to regenerate forest areas that are severely damaged by insects, disease, or other disturbance agents. When even-aged cutting methods create openings that exceed 40 acres (see the definition of opening), approval of these treatments requires 60 days public notice and review by the regional forester.
- 3 Clearcutting shall only be used as a cutting method only where it is determined through site-specific analysis to be the optimum method for a particular area to make progress toward desired conditions.
- 4 The maximum size opening that may be created in one harvest operation for the purpose of creating an even-aged [stand](#) shall not exceed 40 acres except when it is following a large-scale disturbance event such as a stand-replacing fire, wind storm, or insect or disease outbreak.

### **Guidelines for All Terrestrial ERUs**

#### **FW-TerrERU-All-G**

- 1 Management activities such as vegetation treatments or other restoration actions should be designed to maintain or move toward desired conditions, to minimize impacts to other uses and resources, and to maintain biodiversity created by inclusions, landscape variability, and transition zones.
- 2 Naturally ignited fires (lightning-caused fires) should be allowed to burn in fire-adapted ERUs when burning conditions facilitate progress toward desired conditions.
- 3 If needed to support restoration activities, seeding with native species appropriate for the ecological unit (or similar in elevation, soil type, and ecosystem) should be used to restore the desired native species composition of the area. Use of desirable, non-native plant materials may be allowed where native plant materials are unavailable, cost-prohibitive, insufficient to address site-specific problems, and the non-native plant materials do not impede re-establishment of native species.
- 4 Stringers should be protected from uncharacteristic disturbances to prevent stand replacement and to protect their unique contribution to habitat diversity.

### **Management Approaches for All Terrestrial ERUs**

Fire is essential for ecosystem function and for maintaining or moving toward desired conditions in ecosystems where fire is the primary natural disturbance. Primary natural disturbances in Desert Communities, Alpine Tundra, and riparian areas do not include fire, but rather include flooding, precipitation, temperature, wind, avalanches, and ultraviolet radiation. When used as a tool, fire can effectively restore forest structure when used alone or when combined with mechanical treatments. Mechanical treatments may be costly, so the capacity to implement such treatments across the landscape may be limited. Strategic placement and design of mechanical treatments increases their effectiveness in protecting values at risk.

In areas of high vulnerability to climate change, consider the following approaches to facilitate natural adaptation to changing conditions. Because many early-mid species or species characteristic of lower life zones are adapted for warmer and drier conditions, emphasize early-mid seral species or species from lower life zones over late-seral species and species of higher life zones. Consider managing tree basal area at the low end of the range of desired conditions to mitigate water stress.

Foster partnerships with the Rocky Mountain Research Station and other science organizations to identify and develop concepts, tools, and research opportunities applicable to ecosystem restoration and vegetation management on the Coconino NF.

Work with volunteer groups on projects that improve vegetation and ecosystem function.

Consider inclusions, landscape variability, and transition zones during project planning to support biodiversity at the fine and mid scales. Inclusions and variability could include individual species, such as alligator juniper or blue spruce, or microclimates, such as cool, moist sites in a more arid environment, or warm, dry sites surrounded by more arid conditions.

### **Desert Communities**

See appendix A, map 6.

#### **General Description and Background for Desert Communities**

The Desert Communities ERU (also known as desert scrub) covers approximately 62,877 acres within lands managed by the Coconino NF. This low-elevation ERU is composed of two vegetation subtypes that vary in composition and structure: creosote bush-dominated sites and crucifixion thorn-dominated sites. The arid climate and calcareous soils may significantly limit potential for vegetative growth, yet this ERU supports a unique community of endemic plants adapted to calcium-rich soils and encompasses the Verde Valley Botanical Area. Some soils in this ERU contain significant quantities of calcium carbonate, and a pH of 8 or more is common. Primary natural disturbances are drought, flooding, and excessive wind events. Steep slopes generally have high erosion hazard and some soil types have high wind erodibility. Many plants in this community are fire-intolerant even though wildfire has historically occurred at infrequent intervals. Human-caused fires are a threat to this ecosystem.

Desert Communities ERU contains numerous roads and private land parcels and adjoins the communities of Cottonwood, Camp Verde, Cornville, and Page Springs.

### **Desired Conditions for Desert Communities**

FW-TerrERU-DC-DC

- 1 Arroyos and gullies are stabilizing and recovering.
- 2 The inherently sparse vegetation of Desert Communities is dominated by native shrubs, cacti, forbs, and grasses of various seral stages where they naturally occur. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent). Plant composition can vary considerably at the fine- and mid-scales depending on site capability (as determined by TEUI or other appropriate ecological classification system) and climate, topography, soils, and smaller scale disturbances. Plants form beneficial relationships with soil microbes. Roots are covered with soil and there is little evidence of plants perched above the soil with exposed roots (pedestalling). Although the abundance of native annual species can increase following exceptionally wet seasons, the abundance of annual species does not facilitate the spread, [intensity](#), or severity of uncharacteristic fire.
- 3 Uncharacteristic fires are infrequent and localized.
- 4 Native endemic plant species are present in natural patterns of abundance and density, and regenerating successfully. Habitat is preserved and remains suitable for Arizona cliffrose (a federally endangered species) and other endemic plants. Population numbers for Arizona cliffrose remain static or increase over the long term within natural climatic variability.

### **Management Approaches for Desert Communities**

Work with stakeholders to develop collaborative solutions to problems associated with Desert Communities ERU resources and activities. Resources and activities could include rare plants; archaeological and historical sites; recreation; geological features; and management of water, fire, soil, and vegetation.

### **Grassland ERUs**

See appendix A, maps 6 and 9.

### **General Description and Background for Grassland ERUs**

The Coconino NF has three different grassland ERUs: Semi-desert Grassland, Great Basin Grassland (also known as Colorado Plateau/Great Basin Grassland), and Montane/Subalpine Grassland. One of the defining characteristics of grasslands is the amount of canopy cover, generally less than 10 percent. Many of these grasslands within the Forest boundary are at least partially in private ownership.

#### **Semi-desert Grasslands**

Semi-desert Grassland ERU covers approximately 89,701 acres within lands managed by the Coconino NF. This is a low-elevation grassland and shrubland community that is bounded by Desert Communities ERU at lower elevations and Pinyon Juniper Evergreen Shrub ERU at higher elevations. Plant species may include Mahonia, catclaw mimosa, crucifixion thorn, Utah juniper, Arizona juniper, one-seed juniper, and a variety of agaves and shrubs. Perennial grass species include a variety of grama grasses, curly mesquite grass, squirrel tail, needle and thread grass, three-awn, and bush muhly. They contain numerous roads and private land parcels and adjoin the communities of Camp Verde, Cottonwood, and Cornville. Soils in this ERU are

generally not suited for intensive disturbance because they are predominantly shallow, have high amounts of surface rock, high amounts of carbonates at or near the surface, or high amounts of clay with low bearing strength (that is, the inability to support a load without soil movement).

The Verde Formation (TEUI soil units 350, 381, and 385) is a unique sub-component of the Semi-desert Grassland ERU. The white soils of the Verde Formation are Pleistocene lakebed deposits, with a unique chemical composition compared to the surrounding areas. They have high levels of calcium carbonate, a high pH, limited soil moisture potential, generally sparse vegetation, low litter, and have low productivity. They support a variety of relict, disjunct, and endemic plant species, including the endangered Arizona cliffrose, because the surrounding dominant species are generally excluded from this soil type, thereby reducing competition for moisture and allowing the rarer species to survive. The Verde Valley is one of a chain of narrow basins across central Arizona at the northern edge of the Sonoran Desert. These narrow basins have sharply different soils compared to the surrounding areas, have a different geological history, and different plant composition. In the Verde Formation soils, primary natural disturbances are weather, climate, soil chemistry, and natural soil movement (inherent erosional processes) and fire is infrequent and low to mixed severity. In areas outside the Verde Formation soils, primary natural disturbances are climate, low-intensity/high-severity fire, and natural soil movement (such as natural shrink-swell and seasonal surface cracking).

### **Great Basin Grasslands**

Great Basin Grassland ERU covers approximately 92,842 acres of the Coconino NF within lands managed by the Coconino NF. These grasslands are more arid than Montane/Subalpine Grassland ERU. Typical locations are Anderson Mesa and near Wupatki National Monument. They consist mostly of grasses with smaller amounts of forbs and shrubs. Trees can be present in trace amounts depending on the soil; however, tree canopy is increasing in some areas. Species include, but are not limited to, western wheatgrass, black grama, blue grama, galleta grass, hairy grama, spike muhly, and needle and thread grass. Trees may include sparse one-seed juniper, alligator juniper, red berry juniper, Utah juniper, and Colorado pinyon pine. Natural disturbances are weather, low-intensity/high-severity fire (from adjacent ERUs), and natural soil movement (such as natural shrink-swell and seasonal surface cracking).

### **Montane/Subalpine Grasslands**

The higher elevation Montane/Subalpine Grassland ERU covers approximately 23,656 acres within lands managed by the Coconino NF. Typical locations of the montane portion include Kendrick Park, Antelope Park, and Bargaman Park whereas the subalpine portion is located on the San Francisco Peaks, on deeper soils with warmer, drier aspects than adjacent mixed conifer or spruce-fir vegetation. This ERU is more productive than Great Basin, and Semi-desert Grassland ERUs.

In the Montane portion of this ERU, species include, but are not limited to, muttongrass, mountain muhly, spike muhly, Arizona fescue, blue grama, red three-awn, squirreltail, yarrow, and pine dropseed. Non-native Kentucky bluegrass is present. Vegetation in some of the Montane Grassland soil types is maintained by fire. Trees occur along the periphery of Montane Grasslands and tree canopy is increasing in some areas. These grasslands are susceptible to channel and gully erosion, which can then result in lowering of the seasonal, perched water table. Natural disturbances are weather, low-intensity/high-severity fire (from adjacent ERUs), and natural soil movement (such as natural shrink-swell and seasonal surface cracking). Montane Grasslands were the focus of late 1800s and early 1900s homesteading activity within the ponderosa pine.

The Subalpine portion of this ERU covers approximately 2,462 acres within lands managed by the Coconino NF. It is more productive than the montane portion because annual precipitation is higher and there are higher amounts of soil organic matter. The subalpine portion may harbor several plant associations with varying dominant grasses and herbaceous species. Such dominant species may include: pine dropseed, nodding brome, various sedges, Arizona fescue, mountain junegrass, mountain muhly, muttongrass, and squirreltail. Trees may occur in trace amounts within these grasslands and along their periphery. Shrubs may also be present. Subalpine meadows are seasonally wet and closely tied to snowmelt. They are often maintained by fire from adjacent ERUs.

### **Desired Conditions for Grassland ERUs**

FW-TerrERU-Grass-DC

#### *Landscape Scale (1,000 to 10,000+ acres)*

- 1 Grasslands occur on soils classified as Mollisol or those with relatively thick organic surfaces. Canopy cover of trees and shrubs on grasslands is less than 10 percent. Grassland vegetation is dominated by native grasses, forbs and annuals of varying seral stages where they naturally occur. Early seral stages will typically contain more forbs, and as stages get older, they are dominated by more grasses and fewer forbs. Native plant species are present in natural patterns of abundance and density, and regenerate successfully in most years depending on seasonal climatic conditions. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent). Plant composition can vary considerably at the fine- and mid-scales depending on site potential (as determined by TEUI or other appropriate ecological classification system) and climate, topography, soils, and smaller scale disturbances. Succulents are present on more arid sites.
- 2 Native understory vegetation is capable of supporting frequent surface fires (Fire Regime II) except in Verde Formation soils, which support infrequent fires of low to mixed severity. The abundance of invasive annual species does not facilitate the spread, intensity, or severity of uncharacteristic fire.
- 3 Grasslands are connected based on the distribution of soils classified as Mollisol or those with relatively thick organic surfaces and are not fragmented.
- 4 A mix of cool and warm season understory species, of varying heights and density, provide food and cover for invertebrates and wildlife, including pronghorn.

#### *Mid-Scale (10 to 999 acres)*

- 5 In Semi-desert Grasslands, arroyos and gullies are stabilizing and recovering. Water infiltration is at natural rates, which reduces arroyos and gullies and prevents head cuts from forming in drainages.
- 6 In Montane Grasslands, soil surface structure is granular or well aggregated, which promotes water infiltration at natural rates and reduces runoff. Natural surface drainages and subsurface flow patterns maintain waterflow into connected waterbodies or streams.

#### *Fine Scale (less than 10 acres)*

- 7 Trees occur as individuals, but occasionally in smaller groups.



- 8 A mosaic of vegetation patches with varying vegetation densities is present, depending on site potential (as determined by TEUI or other appropriate ecological classification system). Densely vegetated areas provide cover for ground-nesting birds and pronghorn fawns. Bare areas are the result of natural processes such as freeze-thaw action, erosion, drought, or prairie dog burrowing.
- 9 Populations of big sacaton grass (*Sporobolus wrightii*) are reproducing sustainably and expanding on suitable habitat on the Red Rock Ranger District.

### Objectives for Grassland ERUs<sup>6</sup>

#### FW-TerrERU-Grass-O

- 1 Restore or improve at least 3,500 acres of Semi-desert Grasslands during each 10-year period over the life of the plan.
- 2 Restore or improve 10,800 to 12,400 acres of Great Basin Grasslands during each 10-year period over the life of the plan.
- 3 Restore or improve 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10-year period over the life of the plan.

### Guidelines for Grassland ERUs

#### FW-TerrERU-Grass-G

- 1 On soils classified with clayey (Vertic) subgroups in Great Basin Grasslands, prescribed fire and resource objective fires should not be used until natural vegetative ground cover is near potential to promote satisfactory and functional soils.
- 2 Grassland composition, structure, and productivity and soil function should be protected and enhanced using methods such as fencing, aerating soil (decompacting soils), improved grazing strategies, or strategic location of constructed waters or of roads.

### Management Approaches Grassland ERUs

Collaborate with partners and stakeholders on grassland restoration, grassland connectivity, and education.

Coordinate with Arizona Game and Fish Department (AZGFD) and U.S. Fish and Wildlife Service on objectives for wildlife conservation, education, habitat restoration, and [improvements](#), particularly regarding pronghorn, prairie dogs, and black-footed ferrets.

Species-specific wildlife needs are addressed on a site-specific basis and considered during project-level planning and implementation. For example, where they occur, pronghorn typically benefit from grasses and shrubs greater than 11 inches in height to provide fawns protection from predators during the fawning season (AZGFD 2011). This habitat consideration is, however, dependent in large part on weather and site capability. Optimal fawning habitat conditions may not always be achievable due to variable environmental conditions (such as winter snowfall and spring precipitation). Project specialists work together to determine achievable conditions that

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<sup>6</sup> Objectives for Semi-desert Grasslands and Great Basin Grasslands maintain and improve habitat for pronghorn.

would optimize wildlife habitat at the site level, and give consideration to follow-up monitoring that could assess how well such conditions have been met.

Provide media and public information focused on the unique properties of, and appropriate activities within, grasslands.

## **Interior Chaparral**

See appendix A, map 6.

### **General Description and Background for Interior Chaparral**

Interior Chaparral covers approximately 50,471 acres within lands managed by the Coconino NF. This shrub-dominated ERU varies from widely scattered pockets within grasslands and woodlands to more extensive areas on steep slopes. Species composition and dominance varies across the landscape depending on fire history, soils and topography. Fire is the primary natural disturbance. Some chaparral species have fire adaptations such as needing fire or smoke for seedling germination and establishment. Soil productivity is naturally low and most soils are inherently unstable due to the steep slopes.

### **Desired Conditions for Interior Chaparral**

FW-TerrERU-IC-DC

- 1 Interior Chaparral vegetation is dominated by native shrubs of varying seral stages where they naturally occur. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent). Plant composition can vary considerably at the fine- and mid-scales, depending on site potential (as determined by TEUI or other appropriate ecological classification system) and topography, soils, and smaller scale disturbances. The composition and structure of vegetation shifts on the landscape over time as a result of succession and disturbance, and reflects a mix of early, middle, and late seral stages.
- 2 Early seral native grass and forbs regenerate successfully in most years depending on seasonal climatic conditions. Mid- to late seral stages are dense thickets with considerable shrub litter (such as small stems, leaves). Standing dead material accumulates in areas that have not burned for several decades. Canopy may be more open on drier sites.
- 3 Interior chaparral vegetation supports Fire Regime IV. Stand-replacing fires at 35- to 100-year fire return intervals create a mosaic of variably aged and sized patches on the landscape. Native fire-adapted species re-sprout vigorously after fire, helping to prevent excessive erosion. Invasive plants do not alter the fire regime. The abundance of invasive annual species does not facilitate the spread, intensity, or severity of uncharacteristic fire.
- 4 Soil productivity is generally low, and most soils are inherently unstable on steep slopes. Vegetation and litter cover protects soil from accelerated erosion.

### Guidelines for Interior Chaparral

FW-TerrERU-IC-G

- 1 Treatment locations should be rotated to re-establish seed banks, protect soils from accelerated erosion, and facilitate the development of fuel loads and spatial continuity of fuels necessary for fire.

### Management Approaches for Interior Chaparral

Emphasize coordination with local partners and stakeholders to reduce the risk of uncharacteristic fires that are hazardous to values in the WUI on the Coconino NF and adjacent lands of other ownership.

### Pinyon Juniper ERUs

See appendix A, map 7.

### General Description and Background for Pinyon Juniper ERUs

There are three pinyon juniper ERUs on the Coconino NF: Pinyon Juniper with Grass (includes Juniper with Grass), Pinyon Juniper Evergreen Shrub, and Pinyon Juniper Woodland (also called Pinyon Juniper (persistent)). Pinyon and juniper ERUs are dominated by one or more species of pinyon pine and/or juniper, and can occur with a grass and forb-dominated understory (Pinyon Juniper with Grass ERU), a shrub-dominated understory (Pinyon Juniper Evergreen Shrub ERU), or a sparse discontinuous understory of some grasses and/or shrubs (Pinyon Juniper Woodland ERU). Pinyon pine (including two-needle pinyon and single-leaf pinyon) is common as well as one-seed, Utah, redberry, Rocky Mountain, and alligator juniper and a lesser abundance of oaks. Species composition and stand structure vary by location primarily due to precipitation, elevation, topography, temperature, and soil type. In some locations, grassland soil types are interspersed with Pinyon Juniper soil types. Spreading, low-intensity surface fires had a very limited role in molding stand structure and dynamics of most pinyon and juniper communities in the historical landscape except where tree density is sparse and grass cover is significant, such as in Pinyon Juniper with Grass. Where low to moderate densities of shrubs dominate the understory, mixed severity fires sustained an overstory comprised of individual trees and small groups.

Pinyon Juniper with Grass covers about 261,454 acres and Pinyon Juniper Evergreen Shrub covers about 263,554 acres within lands managed by the Coconino NF. Pinyon Juniper Woodland covers about 75,439 acres within lands managed by the Coconino NF.

### Desired Conditions for Pinyon Juniper ERUs

FW-TerrERU-PJ-DC

- 1 Pinyon Juniper with Grass is generally [uneven-aged](#) and open in appearance. Trees occur as individuals and small groups and range from young to old. Patch sizes of woodlands range from individual trees and [clumps](#) that are less than one-tenth acre, to tree groups of approximately an acre.
- 2 In Pinyon Juniper with Grass, snags and older trees with dead limbs are scattered across the landscape. At the landscape scale, snags 8 inches and above at [diameter at root collar](#)

- average 5 snags per acre, while snags 18 inches and above average 1 snag per acre. Coarse woody debris increases with succession and averages 1 to 3 tons per acre.
- 3 In Pinyon Juniper with Grass, fires typically occur every 1 to 35 years with low severity and patches of mixed severity (Fire Regime I) favoring regrowth and germination of native grasses and forbs.
  - 4 In Pinyon Juniper with Grass, scattered shrubs and a dense herbaceous understory including native grasses, forbs, and annuals, are present to support frequent surface fires. Shrubs average less than 30 percent canopy cover. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at the fine- and mid- scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
  - 5 In Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, [old-growth](#) structure occurs throughout the landscape, generally in small areas as individual old-growth components, or as clumps of old growth. Old-growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
  - 6 In Pinyon Juniper Evergreen Shrub, a mix of trees and shrubs occurs as a series of vegetation states that move over time from herbaceous-dominated to shrub-dominated to tree-dominated. Trees occur as individuals or in smaller groups ranging from young to old. Pinyon trees are occasionally absent, but one or more juniper species is always present. Arizona cypress and live oak are scattered across the landscape. Typically groups are even-aged in structure with all ages represented across the landscape for an overall uneven-aged grouped appearance. The patch size of woodlands ranges from 10 to less than 100 acres.
  - 7 In Pinyon Juniper Evergreen Shrub, snags and old trees with dead limbs/tops are scattered across the landscape. Large dead wood is present. Snags 8 inches and above at diameter at root collar average 3 snags per acre, while snags 18 inches and above average 1 snag per acre. Coarse woody debris averages 2 to 4 tons per acre.
  - 8 In Pinyon Juniper Evergreen Shrub, fires are typically mixed-severity (Fire Regime III) although some evergreen shrub types exhibit occasional high-severity fires (Fire Regime IV).
  - 9 In Pinyon Juniper Evergreen Shrub, the understory is dominated by low to moderate density of shrubs, depending on seral stage. The shrub component consists of one or a mix of evergreen shrub, oak, manzanita, mountain mahogany, sumac, skunk bush, Fremont barberry, and other shrub species, which are well distributed. A variety of low- to high-growing native perennial and annual grasses and forbs are present in the [interspaces](#). Shrubs average greater than 30 percent canopy cover. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at fine- and mid-scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
  - 10 In Pinyon Juniper Woodland, at the landscape scale, even-aged patches of pinyons and junipers form multi-aged woodlands. Very old trees (greater than 300 years old) are present.

Tree density and canopy cover are high, and where interlocking crowns shade the ground over extensive areas, shrubs are sparse to moderate and herbaceous cover is low and discontinuous. The patch size of woodlands ranges from tens to hundreds of acres.

- 11 In Pinyon Juniper Woodland, old-growth structure and components are often concentrated in mid- and fine-scale units as patches of old growth. Old-growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
- 12 In Pinyon Juniper Woodland, snags and older trees with dead limbs and/or tops are scattered across the landscape. Snags 8 inches and above at diameter at root collar average 5 snags per acre, while snags 18 inches and above average 1 snag per acre. Coarse woody debris increases with succession and averages 2 to 5 tons per acre.
- 13 In Pinyon Juniper Woodland, fire as a disturbance is less frequent and variable due to differences in ground cover. The fires that do occur are mixed- to high-severity (Fire Regime III, IV, and V).
- 14 In Pinyon Juniper Woodland, ground cover consists of shrubs, perennial grasses, and forbs and some sites are capable of carrying surface fire. The amount of shrub cover depends on the TEUI unit. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at fine- and mid-scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
- 15 Plant litter (such as leaves, needles) and coarse woody debris create microclimate conditions necessary for pinyon seed germination. There are sufficient [nurse trees](#) to provide microclimate conditions in the understory. Nurse trees provide improved nutrient and soil properties, higher soil moisture, lower temperatures, and light levels which increase pinyon seedling survival under harsh conditions.
- 16 A robust crop of pinyon nuts is regularly produced, consistent with the capability of the site.

### **Objectives for Pinyon Juniper ERUs**

#### **FW-TerrERU-PJ-O**

- 1 [Mechanically treat](#) between 1,000 and 10,000 acres of Pinyon Juniper with Grass during each 10-year period over the life of the plan.
- 2 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres of Pinyon Juniper with Grass within the [natural fire regime](#) during each 10-year period over the life of the plan.
- 3 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres in Pinyon Juniper Evergreen Shrub within the natural fire regime during each 10-year period over the life of the plan.

## **Guidelines for Pinyon Juniper ERUs**

### **FW-TerrERU-PJ-G**

- 1 In all pinyon juniper ERUs, soils classified as Mollisols should be managed toward grassland desired conditions.
- 2 In areas where there is little understory and treatments are proposed, slash treatments (such as lop and scatter and mastication) should be used that improve herbaceous vegetation growth, [watershed condition](#), and soil productivity. The intent is to encourage response in herbaceous vegetation and allow smaller debris to decompose in place on the ground.
- 3 Large accumulations of green material (such as slash, wind-thrown trees) should be managed to reduce the risk of uncharacteristic bark beetle outbreaks.
- 4 To increase small mammal occupancy in areas where coarse woody debris is deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. The number and distribution of retained slash piles should be consistent with [scenic integrity objectives](#) (SIO) and balanced with potential threats from bark beetles and fire/fuels concerns. If slash is scattered, it should be at a height that still allows big game movement.
- 5 In Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, the development of old-growth conditions should be encouraged in areas where old growth is lacking to perpetuate old-growth forest components. Uneven-aged vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old-growth characteristics across the landscape over time.

## **Management Approaches for Pinyon Juniper ERUs**

In all pinyon juniper ERUs, consider managing soils classified as Mollisols (soils with relatively thick organic surfaces) as grasslands, because these soils are typical of and generally develop under grassland conditions.

## **Aspen and Maple**

### **General Description and Background for Aspen and Maple**

Aspen is an early seral shade-intolerant species that occurs as groups or clones. Its distribution can vary in space and time and is influenced by soil type, soil moisture, low temperatures, and disturbances (primarily wildfires, but occasionally flooding) that stimulate root sprouting and colonization. Aspen sites may or may not have a significant conifer component depending on successional status. Aspen primarily occurs in the Mixed Conifer with Infrequent Fire and Spruce-Fir ERUs, but may also be found in cool moist locations in the Mixed Conifer with Frequent Fire and Ponderosa Pine ERUs.

Species present in aspen groves include native plant species such as Colorado blue columbine and Rusby milkvetch, native animals such as woodpeckers, and a variety of fungi and microorganisms.

An accelerated aspen decline on the Coconino NF was documented between 2003 and 2007, due to a combination of a significant frost event, long-term drought, and bouts of defoliation from

western tent caterpillars (Fairweather et al. 2008). This was more pronounced on low-elevation dry sites than wetter high-elevation sites. Widespread death of mature aspen trees, chronic browsing by ungulates (deer and elk in this study), and advanced conifer reproduction could result in further loss of this ecologically unique vegetation. Livestock can also graze on aspen.

Maple is a shade-tolerant later seral species generally found in wetter and cooler sites, canyons, and draws. It is currently more abundant in the bottom than in the top of snow-melt drainages on the Mogollon Rim. Bigtooth maple is a deciduous tree or shrub and its form is dependent on the moisture regime. It is generally fire-tolerant, sprouting from root crowns after low to moderate severity burns. The white fir/bigtooth maple community represents a unique vegetation type found in Arizona at only a few locations along the Mogollon Rim. It is important wildlife habitat especially for birds and black bears.

### **Desired Conditions for Aspen and Maple**

#### **FW-TerrERU-AspMpl-DC**

- 1 Where they naturally occur, all age classes of aspen and maple are present in groups or patches and are regenerating and vigorous, providing habitat for a variety of species. Natural and human disturbances are sufficient to maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. The size and number of patches depend on the scale and type of disturbance as well as microsite conditions such as elevation, soil type, aspect, and site productivity. A diverse understory consisting of native [graminoids](#), forbs, and/or shrubs is present and has a variety of seral stages and age classes.
- 2 The location of aspen shifts across the landscape as a result of succession and disturbance. Aspen may disappear from portions of the landscape due to succession; however, aspen patches result or are maintained from natural levels of disturbances (such as insects, disease, wind, and fire) as well as mechanical treatments. Aspen would be primarily found in the early and mid development seral stages in Mixed Conifer with Infrequent Fire and Spruce-Fir ERUs as shown in appendix E.
- 3 Where early seral aspen is present, it is reproducing successfully and growing into older age classes. Older aspen generally occur within stands or patches where disturbance is less frequent. Characteristics of older aspen include old trees, dead trees (snags), coarse woody debris, and logs. Amounts of these characteristics and tree density vary depending on microsite, time since disturbance, and whether it is a young or old aspen stand. Aspen snags (greater than 12 inches d.b.h.) are a well-distributed component.

### **Objectives for Aspen and Maple**

#### **FW-TerrERU-AspMpl-O**

- 1 Restore at least 1,000 acres of aspen and maple during each 10-year period over the life of the plan. Restoration could include, but is not limited to, activities that promote regeneration, remove competing vegetation, or remove disturbances that could negatively impact aspen or maple.

### **Guidelines for Aspen and Maple**

FW-TerrERU-AspMpl-G

- 1 Where needed, aspen and maple should be protected from excessive herbivory using methods such as fencing that protect regeneration and recruitment. Fences should be removed when no longer needed to allow wildlife and human access.

### **Management Approaches for Aspen and Maple**

Regularly inspect and maintain fences used to protect aspen and maple to ensure recovery.

### **Ponderosa Pine**

See appendix A, map 8.

### **General Description and Background for Ponderosa Pine**

The Ponderosa Pine ERU covers approximately 797,171 acres within lands managed by the Coconino NF. About 7 percent of the ponderosa pine within the forest boundary is at least partially in other ownership or managed by other agencies.

The vast majority of the Ponderosa Pine ERU is made of two sub-types: Ponderosa Pine Bunchgrass and Ponderosa Pine Gambel Oak. A very small portion of the ERU includes the Ponderosa Pine Evergreen Oak subtype, some with a perennial grass understory and some with an evergreen shrub understory. Ponderosa Pine Evergreen Oak generally occurs along the Mogollon Rim in the transition zones bordering more arid ERUs such as Pinyon Juniper Evergreen Shrub.

Ponderosa pine is the dominant species. In some areas, Gambel oaks or evergreen oaks (such as Emory oak, Arizona white oak, silverleaf oak, and grey oak) may be well represented. Other species may include aspen, Douglas-fir, juniper species, pinyon pine species, white fir, and Arizona cypress. The understory varies depending on site-specific conditions and may include perennial grasses, forbs, and shrubs, or evergreen shrubs (manzanita, turbinella oak, sumac species, and mountain mahogany species). Fire is the primary natural disturbance.

Ponderosa Pine Gambel Oak is particularly important to many wildlife species, including Mexican spotted owls. Higher species richness has been correlated with higher densities of Gambel oak. This subtype provides important nesting and foraging habitat for wildlife. Ponderosa Pine Evergreen Oak with a perennial grass understory is extremely similar to the Ponderosa Pine/Gambel Oak subtype and is almost identical in terms of structure and fire regime. Ponderosa Pine Evergreen Oak with an evergreen shrub understory, which occurs in the drier and warmer portions of the transition zone, exhibits somewhat more even-aged dynamics and supports mixed-severity fires that occur infrequently.

The plan direction below is intended to apply to all of the Ponderosa Pine Gambel Oak subtype. In addition, a subset of the Ponderosa Pine Gambel Oak subtype will meet the definition of recovery habitat for Mexican spotted owls. Recommendations regarding Mexican spotted owl habitat are contained in the “Mexican Spotted Owl Recovery Plan” (USDI Fish and Wildlife Service 2012).



Ponderosa Pine also contains unique features such as ponderosa pine stringers—noncontiguous, narrow communities of predominantly ponderosa pine that extend below its normal elevation distribution into other ERUs. Ponderosa pine stringers provide connectivity between two vegetation communities, as well as a unique microclimate in lower-elevation environments.

### **Desired Conditions for Ponderosa Pine**

FW-TerrERU-PP-DC

#### *Landscape Scale (1,000 to 10,000+ acres)*

- 1 Ponderosa Pine has a mosaic of trees with varying age classes and understory vegetation, which provide habitat for a variety of species, including Mexican spotted owls and northern goshawks, and surface fuels conducive to low-severity fires.
- 2 The composition, structure, and function of vegetation conditions are resilient to the frequency, extent, intensity, and severity of disturbances and climate variability. The landscape is a functioning ecosystem that contains its components, processes, and conditions that result from natural levels of disturbances (such as insects, diseases, fire, dwarf mistletoe, lightning, drought, and wind), including snags, downed logs, and old trees. Dwarf-mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures. Infections may be present in stands, particularly those that include Douglas-fir or ponderosa pine. Infection size, degree of severity, and amount of mortality varies among infected stands. Grasses, forbs, shrubs, and needle cast (fine fuels), and small trees maintain the natural fire regime. Vegetative ground cover provides protection from accelerated soil erosion, promotes water infiltration, and contributes to soil nutrient cycling, plant and animal diversity, and to ecosystem function. The amount of shrub cover depends on the TEUI unit. Across the Ponderosa Pine Bunchgrass and Ponderosa Pine/Gambel Oak subtypes, perennial grasses and forbs dominate the understory, though shrubs are present throughout. In areas where Ponderosa Pine Evergreen Oak subtype occurs and perennial grasses dominate the understory, shrubs average less than 30 percent canopy cover and do not inhibit ponderosa pine regeneration. In areas where Ponderosa Pine Evergreen Oak subtype occurs and evergreen shrubs dominate the understory, shrubs average greater than 30 percent canopy cover. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at the fine- and mid- scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
- 3 Frequent, low-severity fires (Fire Regime I) are characteristic in the vast majority of this ERU, including throughout northern goshawk home ranges. Spatial heterogeneity and discontinuous crowns (interspaces between groups and single trees) prevents crown fire spread. However, in the Ponderosa Pine Evergreen Oak subtype, where evergreen shrubs dominate the understory, low- and mixed-severity fires are characteristic and burn on the forest floor as well as in the overstory, and crown fires occur in small patches. Natural and human disturbances are sufficient to maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling.
- 4 At the landscape scale, Ponderosa Pine is composed of trees in structural stages that range from young to old and are dominated by ponderosa pine trees. Forest appearance is variable, but generally uneven-aged and open; occasional areas of even-aged structure are present.

Forest arrangement is in individual trees, small clumps, and groups of trees interspersed within variably sized openings of grasses, forbs, and shrubs that are similar to historic patterns. [Openness](#) typically ranges from 10 percent in more productive sites to 70 percent in the less productive sites.

- 5 The ponderosa pine forest vegetation community is composed predominantly of vigorous trees, but [declining](#) trees are a component and provide for snags, top-killed, lightning- and fire-scarred trees, and coarse woody debris (greater than 3-inch diameter), all well-distributed throughout the landscape. Snags, down logs and coarse woody debris are representative of the species within the vegetation community. Ponderosa pine snags are typically 18 inches or greater at [diameter at breast height \(d.b.h.\)](#) and average 1 to 2 snags per acre. There are varying sizes of snags greater than 18 inches d.b.h. In the Gambel oak subtype, large oak snags (greater than 10 inches) are a well-distributed component. Downed logs (greater than 12-inch diameter at mid-point, greater than 8 feet long) average 3 logs per acre within the forested area of the landscape. Coarse woody debris, including downed logs, ranges from 3 to 10 tons per acre and is sufficient to maintain or improve long-term soil productivity and provide cover and food for a variety of species.
- 6 Old-growth structure occurs throughout the landscape consistent with vegetative characteristics of a frequent, low-severity fire regime. Old growth is a component of uneven-aged forests, generally composed of groups of similarly aged trees and single trees interspersed with open grass–forb–shrub interspaces, but occasionally, it occurs in larger even-aged patches where local microsites facilitate less frequent fire regimes. Within-[group](#) variability may be low, but variation among groups is typically high, and proportions of patches with different developmental stages may vary, depending on site-specific conditions. Old-growth components include old trees, dead trees (snags), and dead and downed wood (coarse woody debris including large size classes). Snags and large dead and downed fuels are irregularly distributed across the landscape and may not exist in some patches. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
- 7 In the Ponderosa Pine Gambel Oak and Ponderosa Pine Evergreen Oak subtypes, all sizes, structures (that is, the shrub or tree forms depending on the capability of the site), and ages of oak trees are present in natural patterns of abundance and density. These subtypes are reproducing and maintaining their presence on suitable sites across the landscape. Old oak trees occur as dominant individuals or in small groups. Where they naturally occur, large to moderate-sized oak snags are well-distributed across the landscape, as are moderate to large live oak trees with dead limbs, hollow boles, and cavities. These provide shelter and habitat for rare plants and a variety of wildlife species, including owls and bats.

*Mid-Scale (10 to 999 acres)*

- 8 At the mid-scale, Ponderosa Pine is characterized by variation in the size and number of tree groups depending on elevation, soil type, aspect, and site productivity. The more biologically productive sites contain more trees per group and more groups per area, resulting in less space between groups. At the mid-scale, openness typically ranges from 30 percent in more productive sites to 60 percent in the less productive sites. Openness in outlying sites may be as low as 10 percent in some situations such as in high-elevation, mesic sites or where needed to meet wildlife habitat requirements. Openness in outlying sites may be as high as 90 percent in situations such as low-elevation sites on south-facing slopes, where ponderosa

pine transitions into grasslands, or where site-specific information indicates the site was historically more open. Tree density within forested areas generally ranges from 22 to 89 square feet basal area per acre. Forest conditions may exceed these densities in some areas, such as on steep slopes and in canyons. In addition, the density of larger trees and canopy cover may be higher where needed to manage for Mexican spotted owls. Ground cover consists primarily of perennial grasses and forbs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20 percent, depending on the TEUI unit.

- 9 The mosaic of tree groups generally comprises an uneven-aged forest with all age classes present, including old growth. Groups of seedlings and saplings are maintained at sufficient levels to provide a reliable source of replacement as trees grow and progress into succeeding size and age classes. Infrequently, patches of even-aged forest structure are present. Disturbances (such as insects, diseases, fire, dwarf mistletoe, lightning, drought, and wind) sustain the overall age and structural distribution.
- 10 Diversity of understory species (such as grasses, forbs, and shrubs) is within the capability of the site and provides for water infiltration and soil stability. The understory has a variety of heights of cool and warm season vegetation and produces seed heads and all age classes of vegetation food and cover for wildlife and forage for livestock. A mosaic of dense cover, high amounts of litter, and bare ground provide habitat for a variety of species.
- 11 Fires burn primarily on the forest floor and do not spread between tree groups as crown fire. Single tree torching and small group torching, however, are not uncommon, resulting in a mosaic across the landscape. Crown fires may occur in small patches in the Ponderosa Pine Evergreen Oak subtype where evergreen shrubs predominate in the understory.
- 12 Conditions in [northern goshawk post-fledging family areas](#) are similar to general Ponderosa Pine ERU conditions, except these post-fledging areas contain 10 to 20 percent higher basal area in mid-aged to old tree groups. Conditions in [northern goshawk foraging areas](#) are similar to general Ponderosa Pine ERU conditions. Forest conditions in [northern goshawk nest areas](#) are multi-aged, but are dominated by large trees with relatively denser canopies than other areas in the Ponderosa Pine ERU.

*Fine Scale (less than 10 acres)*

- 13 Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking. Interspaces surrounding tree groups are variably shaped and composed of a grass/forb/shrub mix. Some natural openings contain individual and randomly distributed patches of trees and a diversity of grasses and forbs, which provide habitat for species, including invertebrates, small mammals, migratory birds, and turkey. Trees within groups are of similar or variable ages and may contain species other than ponderosa pine. Size of tree groups typically is less than 1 acre, but they may range from a few to many trees in extent and be larger in areas managed for bald eagles and Mexican spotted owls or where site-specific information indicates the group was larger historically. Old-growth groups contain trees having similar age characteristics and conditions. Such groups may include fairly similar tree ages and sizes or combinations of ages and sizes, limited amounts of dead and downed material, and dead trees and spike tops (snags), but they are readily distinguished from adjacent groups having different characteristics. Groups at the mid-aged to old stages consist of 2 to approximately 40 trees per group.

- 14 Witches brooms (dense mass of branches and stems growing from a single point) may form on trees infected by dwarf mistletoe, providing valuable habitat components for wildlife species.
- 15 Large oak trees and pine-oak groups in the Ponderosa Pine Gambel Oak and Evergreen Oak subtypes provide cooler, moister microsites and higher overstory diversity than found in the Ponderosa Pine Bunchgrass subtype. Acorns provide food for wildlife species.

### **Objectives for Ponderosa Pine**

FW-TerrERU-PP-O

- 1 Use [prescribed cutting](#) to treat 50,000 to 260,500 acres of Ponderosa Pine during each 10-year period over the life of the plan.
- 2 Use [prescribed fire](#) to underburn 150,000 to 200,000 acres of Ponderosa Pine within the natural fire regime during each 10-year period over the life of the plan.
- 3 Use naturally ignited wildfires (lightning-caused fires that are managed for resource objectives) to treat at least 135,000 acres of Ponderosa Pine within the natural fire regime during each 10-year period over the life of the plan.

### **Guidelines for Ponderosa Pine**

FW-TerrERU-PP-G

- 1 To protect old-growth forest components, existing old-growth forest attributes should be protected from uncharacteristic natural disturbances. Methods of protecting existing old-growth forest components on the landscape may include prescribed cutting, prescribed fire, and wildfires managed for resource objectives.
- 2 To perpetuate old-growth forest components, the development of old-growth conditions should be encouraged in areas where old growth is lacking. Uneven-aged vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old-growth characteristics across the landscape over time.
- 3 In promoting an uneven-aged forest condition that maintains or contributes to the restoration of old-growth conditions characteristic of the forest type, preference for retention should be given to presettlement trees, often the largest, oldest, and tallest trees onsite. For Ponderosa Pine, presettlement trees may be determined by the following characteristics described by Thomson (1940) as age class 3 (intermediate to mature) and age class 4 (mature to over-mature) and vigor class A (full), B (medium), C (light), and D (weak) (figure 3 and figure 4):
  - **Age** – approximately 150 years and older.
  - **Bark** – ranging from reddish brown, shading to black in the top with moderately large plates between the fissures, to reddish brown to yellow, with very wide, long and smooth plates.

- **Branching** – ranging from upturned in upper third of the crown, horizontal in the middle third and drooping in the lower third of the crown to mostly large, drooping, gnarled or crooked. Branch whorls range from incomplete and indistinct except at the top to completely indistinct and incomplete.
- 4 To promote old-growth attributes consistent with desired conditions, manage for large Gambel oak trees and snags to be sustained over time.
  - 5 To provide necessary habitat components, the largest and tallest snags representative of the stand and downed logs should be emphasized along edges of openings and within groups/clumps of trees to provide habitat and roost sites for wildlife species such as small mammals, cavity-nesting birds, and tree-dwelling bats.
  - 6 Large accumulations of green material (such as slash, wind thrown trees) should be managed to reduce the risk of uncharacteristic bark beetle outbreaks.
  - 7 To increase small mammal occupancy in areas where logs are deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. This should be consistent with SIOs and balanced with potential threats from bark beetles and fire/fuels concerns.

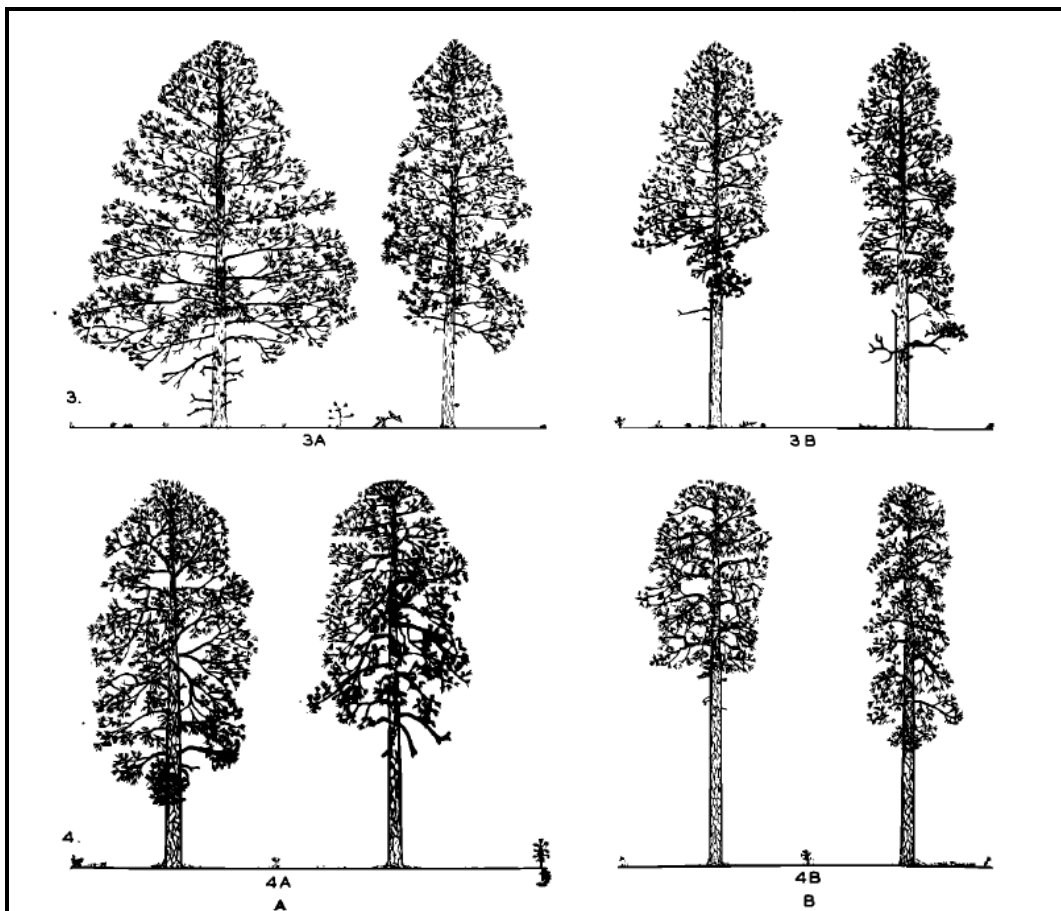
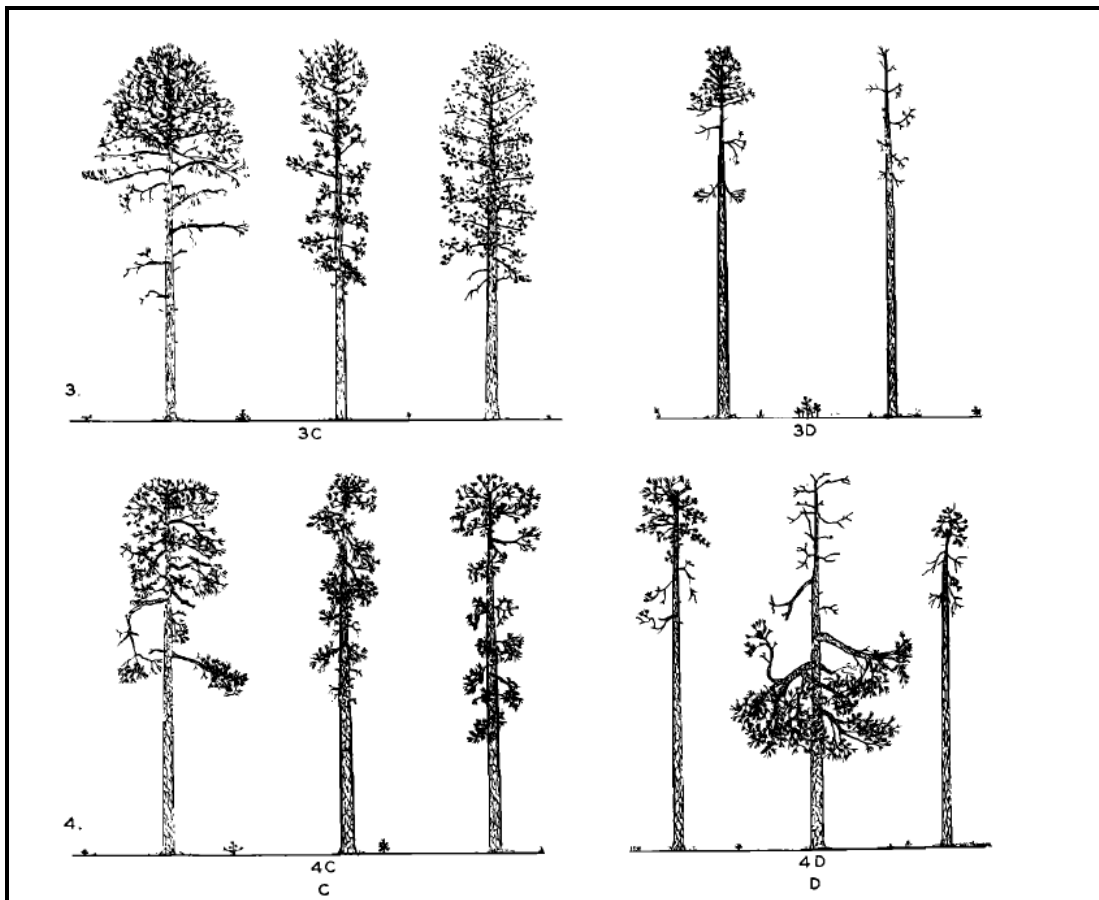


Figure 3. Illustration of intermediate to overmature ponderosa pine showing full and medium vigor classes



**Figure 4. Illustration of intermediate to overmature ponderosa pine showing light and weak vigor classes**

### **Management Approaches for Ponderosa Pine**

Species-specific wildlife needs are addressed on a site-specific basis and considered during project-level planning and implementation. For example, where they occur, turkey typically benefit from grasses and herbaceous vegetation between 4 and 10 inches in height to provide food and cover for young turkeys. This habitat consideration is, however, dependent in large part on weather. Optimal brood habitat conditions may not always be achievable due to variable environmental conditions (such as winter snowfall and spring precipitation). Project specialists work together to determine achievable conditions that would optimize wildlife habitat at the site level, and give consideration to follow-up monitoring that could assess how well such conditions have been met.

Southwestern dwarf mistletoe is a natural disturbance agent in ponderosa pine that occurs at natural levels. In some areas, the infection is widespread and would inhibit the long-term maintenance of diverse age classes and long term sustainability. Treatments for mitigating dwarf mistletoe impacts are not intended to completely eliminate this naturally occurring disturbance agent. Rather, they are typically aimed at reducing infection levels across the stand and increasing host vigor. Doing so would increase stand resilience, reduce susceptibility to insect infestations, increase resistance to droughts and adverse climate change, and allow for development of a

diversity of age classes across the landscape. Treatments can consist of a combination of mechanical treatments and fire.

### **Mixed Conifer ERUs**

See appendix A, map 8.

#### **General Description and Background for Mixed Conifer ERUs**

##### **All Mixed Conifer ERUs**

On the Coconino NF, there are two Mixed Conifer ERUs: Mixed Conifer with Frequent Fire and Mixed Conifer with Infrequent Fire. Mixed Conifer ERUs have higher biodiversity and different wildlife assemblages than Ponderosa Pine. Recommendations regarding Mexican spotted owl habitat are contained in the Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service 2012). Fire is a primary natural disturbance.

These communities also contain unique features such as mixed conifer stringers—noncontiguous, narrow communities of predominantly Mixed Conifer that extend below their normal elevation distribution into other ERUs. Mixed conifer stringers provide connectivity between two vegetation communities as well as a unique microclimate in lower elevation environments.

##### **Mixed Conifer with Frequent Fire ERU**

Mixed Conifer with Frequent Fire is also known as Dry Mixed Conifer. It covers approximately 49,595 acres within lands managed by the Coconino NF, and occurs in cooler, moister, and often higher sites than Ponderosa Pine. It primarily occurs on mountain slopes, canyons, and north-facing slopes. This ERU occupies the warmer and drier sites of the mixed conifer life zone and is characterized by a relatively open structure and a historic fire regime of frequent, low-severity fires and infrequent, mixed-severity fires. These conifer forests are dominated by mainly shade-intolerant trees such as: ponderosa pine, southwestern white pine, limber pine, and Gambel oak, with a lesser presence of New Mexican locust. Shade-tolerant species such as Douglas-fir and white fir tend to increase when lack of fire or other disturbances facilitate development in older stages of succession. Aspen may occur as small groups in north-facing slopes, drainages, and other microsites where cooler, moister conditions prevail.

This ERU typically occurs with an understory of graminoids, forbs, and shrubs. The understory is similar to Ponderosa Pine, but it generally has more sedges, mosses, and liverworts.

##### **Mixed Conifer with Infrequent Fire ERU**

Mixed Conifer with Infrequent Fire is also known as Wet Mixed Conifer. It covers approximately 37,143 acres within lands managed by the Coconino NF, and is generally on moister sites than Mixed Conifer with Frequent Fire such as higher elevations on the San Francisco Peaks or along the Mogollon Rim. It may also occur in canyons and north-facing slopes such as on Hutch Mountain and Mormon Mountain. Tree species composition varies depending on seral stage, elevation, and moisture availability. This ERU can be composed of dominant and codominant species such as: Douglas-fir, New Mexico locust, southwestern white pine and limber pine, and late seral species such as maple, and white fir. Ponderosa pine may be present in minor proportions. The absence of significant proportions of Engelmann spruce and/or corkbark fir distinguishes Mixed Conifer with Infrequent Fire from the Spruce-Fir ERU.

Disturbances typically occur at two temporal and spatial scales: large-scale infrequent disturbances (mostly mixed severity fires at 35- to 200-year frequency or Fire Regime III) and small-scale, frequent disturbances (such as fire, insects, disease, and wind).

Mixed Conifer with Infrequent Fire has an understory with a wide variety of shrubs, grasses, and forbs depending on soil type, aspect, elevation, disturbance, and other factors. In addition, it generally has more sedges, mosses, and liverworts than Mixed Conifer with Frequent Fire and more leaf litter because there are more deciduous species. Lichens may occur on the Douglas-fir trees. Understory vegetation tends to flower more in the spring and, compositionally, be more similar to vegetation in the adjoining Spruce-Fir ERU or in canyons. Big-toothed maple primarily occurs in some drainages on the southern end of the forest.

### **Desired Conditions for Mixed Conifer ERUs**

#### **All Mixed Conifer ERUs**

FW-TerrERU-MC-All-DC

- 1 Mixed Conifer ERUs have a mosaic of trees with varying age classes and understory vegetation, which provide habitat for wildlife species, including Mexican spotted owls and northern goshawks; ground cover for functional soil and watersheds; and fuel for fire to occur according to historic ranges of frequency and severity.
- 2 Native herbaceous and shrub species occur in natural patterns of abundance and density with varying seral stages ranging from young to old and are regenerating successfully. The amount of shrub cover depends on the TEUI unit. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at fine- and mid- scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
- 3 A variety of different sizes and ages of Gambel oak trees are present in natural patterns of abundance and density. Gambel oak is reproducing and maintaining its presence on suitable sites. Large to moderate-sized oak snags are scattered across the landscape, as are moderate to large live oak trees with dead limbs, hollow boles, and cavities, providing shelter and habitat for rare plants and a variety of wildlife species, including owls and bats.
- 4 Dwarf mistletoe occurs at natural levels. Infections may be present in stands, particularly those that include Douglas-fir, spruce, or ponderosa pine. Infection size, degree of severity, and amount of mortality varies among infected stands. Witches brooms may form on trees infected by dwarf mistletoe and may be scattered throughout the infections, providing structural diversity in the stand and improved foraging and nesting habitat for wildlife species such as small mammals (tree squirrels) and raptors such as northern goshawks and Mexican spotted owls.

#### **Mixed Conifer with Frequent Fire**

FW-TerrERU-MC-MCFF-DC

#### ***Landscape Scale (1,000 to 10,000+ acres)***

- 1 At the landscape scale, Mixed Conifer with Frequent Fire is a mosaic of forest conditions composed of structural stages that range from young to old trees. Forest appearance is



variable, but generally uneven-aged and open; occasional patches of even-aged structure are present. Forest arrangement is in small clumps and groups of trees, interspersed within variably sized openings of graminoids, forbs, and shrubs similar to historic patterns. Openness typically ranges from 10 percent in more productive forested sites to 50 percent in the less productive sites. The size and shape of groups, number of trees per group, and number of groups per area are variable across the landscape. Where they naturally occur, groups of aspen and all structural stages of oak are present. Denser tree conditions exist in some locations such as north-facing slopes and canyon bottoms.

- 2 Old-growth structure occurs throughout the landscape, generally in small areas as individual old-growth components or as clumps of old growth. Old-growth components include old trees, dead trees (snags), downed wood (coarse woody debris). The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Old growth exhibits age-class and structural diversity and is often mixed with groups of younger trees or as individual groups of mostly old trees.
- 3 Mixed Conifer with Frequent Fire is composed predominantly of vigorous trees, but declining trees are a component and provide for snags; top-killed, lightning-scarred, and fire-scarred trees; and coarse woody debris (greater than 3-inch diameter), all well distributed throughout the landscape. Snags, down logs, and coarse woody debris are representative of the species in this vegetation community. Snags are typically 18 inches and above at d.b.h. and, average 3 snags per acre. Downed logs (greater than 12-inch diameter at mid-point and greater than 8 feet long) average 3 per acre within forested areas. Coarse woody debris (greater than 3-inch diameter), including down logs, ranges from 5 to 15 tons per acres to maintain long-term soil productivity and provide wildlife habitat.
- 4 The composition, structure, and function of vegetation conditions are resilient to the frequency, extent, intensity, and severity of disturbances and to climate variability. The landscape is a functioning ecosystem that contains all its components, processes, and conditions that result from natural levels of disturbances (such as insects, diseases, fire, dwarf mistletoe, drought, and wind) including: snags, downed logs, and old trees which allows for the establishment and sustainability of the desired forest structure over time. Dwarf-mistletoe occurs in less than 15 percent of host trees in uneven-aged forest structures and less than 25 percent in even-aged forest structures. Graminoids, forbs, shrubs, needle cast (fine fuels), and small trees maintain the natural fire regime. Vegetative ground cover provides protection from accelerated soil erosion, promotes water infiltration, and contributes to soil nutrient cycling, plant and animal diversity, and to ecosystem function.
- 5 Frequent, low-severity fires (Fire Regime I) are characteristic in this vegetation community, including throughout northern goshawk home ranges. Natural and human-caused disturbances are sufficient to maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling.

#### *Mid-Scale (10 to 999 acres)*

- 6 At the mid-scale, Mixed Conifer with Frequent Fire is characterized by variation in the size and number of tree groups, depending on elevation, soil type, aspect, and site productivity. The more biologically productive forested sites contain more trees per group and more groups per area. Openness typically ranges from 10 percent in more productive sites to 50 percent in the less productive sites. Tree density within forested areas generally ranges from 30 to 100 square feet basal area per acre. Forest conditions may exceed these densities

in some areas, such as on steep slopes and in canyons. In addition, the density of larger trees and canopy cover may be higher where needed to manage for Mexican spotted owls.

- 7 The mosaic of tree groups generally comprises an uneven-aged forest with all age classes and structural stages, including old growth. Groups of seedlings and saplings are maintained at sufficient levels to provide a reliable source of replacement as trees grow and progress into succeeding size and age classes. Occasionally, small patches (generally less than 50 acres) of even-aged forest structure are present. Disturbances sustain the overall age and structural distribution.
- 8 Ground cover consists primarily of perennial grasses and forbs capable of carrying surface fire, with basal vegetation values ranging between about 5 and 20 percent, depending on the TEUI unit. Fires burn primarily on the forest floor and do not spread between tree groups as crown fire, but may result in torching of single trees or tree groups.
- 9 Basal area per acre for mid-aged to old tree groups in northern goshawk post-fledging areas is 10 to 20 percent higher than northern goshawk foraging areas and the general forest. Northern goshawk nest areas have forest conditions that are multi-aged, but are dominated by large trees with relatively denser canopies than other areas in Mixed Conifer with Frequent Fire, consistent with current technical guides for northern goshawk in the southwestern United States.

***Fine Scale (less than 10 acres)***

- 10 Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Crowns of trees within the mid-aged to old groups are interlocking or nearly interlocking. Old-growth groups are trees having similar characteristics and conditions. Such groups may include fairly similar tree ages and sizes or combinations of ages and sizes, limited amounts of dead and downed material, and dead trees and spike tops, but they are readily distinguished from adjacent groups having different characteristics. In local areas, trees are randomly distributed. Interspaces surrounding tree groups and patches are variably shaped and composed of a mix of graminoids, forbs, and shrubs. Some natural openings contain individual trees or snags.
- 11 Trees within groups are of similar or variable ages and one or more species. Size of tree groups typically is less than 1 acre, but may be larger in areas managed for Mexican spotted owls or where site-specific information indicates the group was larger historically. Groups at the mid-age to old stages consist of approximately 2 to 50 trees per group.
- 12 Dwarf mistletoe infections may be present on multiple species, but the degree of infection severity and amount of mortality varies among infected trees. Witches' brooms (dense mass of branches and stems growing from a single point) may form on trees infected by dwarf mistletoe, providing valuable habitat components for wildlife species.

**Mixed Conifer with Infrequent Fire**

FW-TerrERU-MC-MCIF-DC

***Landscape Scale (1,000 to 10,000+ acres)***

- 1 At the landscape scale, Mixed Conifer with Infrequent Fire is a mosaic of structural and seral stages ranging from young trees to old. The landscape arrangement is an assemblage of variably sized and aged groups of trees and other vegetation similar to historic patterns. Tree

groups and patches are composed of variable species composition depending on forest seral stages. Patch sizes vary, but are frequently in the hundreds of acres, with rare disturbances in the thousands of acres. An approximate balance of seral stages is present across the landscape; each seral stage is generally characterized by distinct dominant species composition and biophysical conditions. Canopies are generally more closed than in Mixed Conifer with Frequent Fire. Denser tree conditions exist in some locations such as on north-facing slopes and in canyon bottoms. An understory consisting of native graminoids, forbs, and/or shrubs is present.

- 2 Old-growth structure generally occurs over large areas as stands or patches where old-growth components are concentrated. Old-growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and structural diversity. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Snags 18 inches or greater at d.b.h. average from 1 to 5 snags per acre, with the lower range of snags of this size associated with early seral stages and the upper range associated with late seral stages. Snag density in general (greater than 8 inches d.b.h.) averages 20 per acre and provides wildlife habitat and future downed logs. Coarse woody debris, including downed logs, varies by seral stage, with averages ranging from 5 to 20 tons per acre for early seral stages; 20 to 40 tons per acre for mid-seral stages; and 35 tons per acre or greater for late-seral stages. Coarse woody debris and logs provide for long-term soil productivity.
- 3 Mixed Conifer with Infrequent Fire is composed predominantly of vigorous trees, but older declining trees are a component and provide for snags, top-killed, lightning- and fire-scarred trees, and coarse woody debris, all well-distributed throughout the landscape. Number of snags and the amount of downed logs (greater than 12-inch diameter at mid-point, greater than 8 feet long) and coarse woody debris (greater than 3-inch diameter) vary by seral stage.
- 4 The composition, structure, and function of vegetation conditions are broadly resilient to the varying frequency, extent, intensity, and severity of disturbances and climate variability. The forest landscape is a functioning ecosystem that contains all its components, processes, and conditions that result from natural levels of disturbances (such as insects, diseases, dwarf mistletoe, wind, drought, and fire), including: snags, downed logs, and old trees, which allows for the establishment and sustainability of the desired forest structure over time. Mixed-severity fire (Fire Regime III) is characteristic, especially at lower elevations. High-severity fire is rare, and when it occurs, it is at higher elevations or on mesic slopes. Natural and human disturbances are sufficient to maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Vegetative ground cover provides protection from accelerated soil erosion, promotes water infiltration, and contributes to soil nutrient cycling, plant and animal diversity, and to ecosystem function. Mosses and lichens are prevalent and function for recycling soil nutrients.

*Mid-Scale (10 to 999 acres)*

- 5 At the mid-scale, the size and number of groups and patches vary depending on disturbance, elevation, soil type, aspect, and site productivity. Groups and patches of tens of acres or less are relatively common. A mosaic of groups and patches of trees, primarily even-aged, but variable in size, species composition, and age is present. Openness and prevalence of some species (such as aspen) is dependent on seral stages. Grass, forb, and shrub openings created by disturbance may comprise 10 to 100 percent of the mid-scale area, depending on the

disturbances and on the amount of time since disturbance. Aspen is occasionally present in large patches.

- 6 Tree density ranges from 20 to 180 square feet basal area per acre depending upon age, site productivity, time since disturbance, and seral stages of groups and patches. Forest conditions may exceed these densities in some areas, such as on steep slopes and in canyons. In addition, the density of larger trees and canopy cover may be higher where needed to manage for Mexican spotted owls.
- 7 [Fire severity](#) is mixed or high, with a fire return interval of 35 to 200 or more years (Fire Regimes III, IV, and V). Fire and other disturbances maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. During moister conditions, fires exhibit smoldering low-intensity surface behavior with single tree and isolated group torching. Under drier conditions, fires exhibit passive to active crown fire behavior with conifer tree mortality up to 100 percent across mid-scale patches. High-severity fires generally do not exceed 1,000-acre patches of mortality. Other smaller disturbances occur more frequently.
- 8 Forest conditions in northern goshawk post-fledging areas are similar to general forest conditions, except post-fledging areas typically contain 10 percent or greater tree density (basal area) than northern goshawk foraging areas and the general forest. Nest areas in Mixed Conifer with Infrequent Fire have forest conditions that are multi-aged, but are dominated by large trees with relatively denser canopies than other areas.

*Fine Scale (less than 10 acres)*

- 9 In mid-aged and older forests, trees are typically variably spaced with crowns interlocking (grouped and clumped trees) or nearly interlocking. Trees within groups can be of similar or variable species and ages. Locally, patches of random tree distribution are present.
- 10 Small openings are present as a result of disturbances. Some openings may support grasses, forbs, and shrubs and provide habitat for species such as Colorado blue columbine, Rusby milkvetch, Oregon willow herb, and timberland blue-eye grass.

**Objectives for Mixed Conifer ERUs**

FW-TerrERU-MC-MCFF-O

- 1 Use prescribed cutting to treat 2,900 to 15,000 acres of Mixed Conifer with Frequent Fire during each 10-year period over the life of the plan.
- 2 Use prescribed fire on at least 8,000 acres of Mixed Conifer with Frequent Fire within the natural fire regime during each 10-year period over the life of the plan.
- 3 Use naturally ignited wildfires (lightning-caused fires managed for resource objectives) to treat at least 7,500 acres of Mixed Conifer with Frequent Fire within the natural fire regime, during each 10-year period over the life of the plan.

### Guidelines for Mixed Conifer ERUs

#### FW-TerrERU-MC-All-G

- 1 To increase small mammal occupancy in areas where coarse woody debris is deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. The number and distribution of retained slash piles should be consistent with [scenic integrity objectives \(SIO\)](#) and balanced with potential threats from bark beetles and fire/fuels concerns. If slash is scattered, it should be at a height that still allows big game movement.
- 2 To retain structural diversity, existing and developing old-growth forest structures should be protected from uncharacteristic disturbances. Methods of protecting existing old growth may include thinning, prescribed fire, and the use of wildfires managed for resource objectives in adjacent areas, especially those areas that are situated upwind or are topographically lower.
- 3 To promote structural diversity, the development of old-growth structural components should be encouraged in areas where lacking. Vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old-growth characteristics across the landscape over time.

### Management Approaches for Mixed Conifer ERUs

Dwarf mistletoe is a natural disturbance agent in mixed conifer that occurs at natural levels. In some areas, the infection is widespread and would inhibit the long-term maintenance of diverse age classes and long-term sustainability. Treatments for mitigating dwarf mistletoe impacts are not intended to completely eliminate this naturally occurring disturbance agent. Rather, they are typically aimed at reducing infection levels across the stand and increasing host vigor. Doing so would increase stand resilience, reduce susceptibility to insect infestations, increase resistance to droughts and adverse climate change, and allow for development of a diversity of age classes across the landscape. Treatments can consist of a combination of mechanical treatments and fire. Retention of non-host or less susceptible tree species in mixed conifer forests may provide a mitigating and screening benefit that slows the spread of dwarf mistletoe.

### Spruce-Fir

See appendix A, map 10.

### General Description and Background for Spruce-Fir

Spruce-Fir ERU covers approximately 13,946 acres within lands managed by Coconino NF. Spruce-Fir is often dominated by Engelmann spruce, but contains other species depending on elevation. The understory commonly includes currants, maples, honeysuckle, common juniper, alpine clover, and sedges. Spruce-Fir occurs within Kachina Peaks Wilderness and represents some of the coldest, wettest, and highest elevation sites on the forest.

Spruce-Fir can be subdivided into lower elevation (Spruce-Fir Mix) and upper elevation (Subalpine Spruce-Fir), each with differing fire regimes and subdominant species composition. The upper elevation subtype is bounded by Alpine Tundra ERU above about 11,500 feet.

The lower elevation subtype resembles Mixed Conifer with Infrequent Fire except with a different composition of tree species, due to colder and wetter conditions, and it is a transition zone between Mixed Conifer with Infrequent Fire and the upper elevation Spruce-Fir Mix. In the lower elevation subtype, the common tree species are aspen, Douglas-fir, white fir, and southwestern white/limber pine. The [climax](#) forest is dominated by Engelmann spruce, white fir, and occasionally blue spruce. Subdominant species may include corkbark/subalpine fir, white fir, and bristlecone pine. In the upper elevation subtype, the dominant tree species are Engelmann spruce and corkbark fir (subalpine fir). Patches of aspen are occasionally present, but are usually absent. Natural disturbances in these subtypes typically occur at two temporal and spatial scales; large-scale, infrequent disturbances (mostly fire) and small-scale, frequent disturbances (such as fire, insects, disease, and wind).

### **Desired Conditions for Spruce-Fir**

FW-TerrERU-SF-DC

#### *Landscape Scale (1,000-10,000 +acres)*

- 1 Spruce-Fir is a functioning ecosystem that contains all its components, processes, and conditions that result from natural levels of disturbances (such as insects, diseases, fire, avalanches, and wind), including old trees, downed logs, and snags. Spruce-Fir is a mosaic of structural and seral stages ranging from young trees to old and is composed of multiple species. Tree canopies are generally more closed than in mixed conifer. An understory consisting of native grass, forbs, sedges, mosses, liverworts, and/or shrubs is present.
- 2 Old-growth characteristics generally occur over large areas as stands or patches where old-growth components are concentrated. Old-growth components include old trees, dead trees (snags), downed wood (coarse woody debris) and structural diversity. The location of old-growth components shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
- 3 Spruce-Fir is composed predominantly of vigorous trees, but older declining trees are a component. Declining trees are well-distributed throughout the landscape and provide for snags; top-killed, lightning-scarred and fire-scarred trees; and coarse woody debris. The number of snags and amount of downed logs (greater than 12-inch diameter at mid-point and greater than 8 feet long) and coarse woody debris (greater than 3-inch diameter) vary by seral stage.
- 4 The composition, structure, and function of vegetation conditions are broadly resilient to the frequency, extent, intensity, and severity of natural disturbances and to climate variability. Vegetative ground cover and herbaceous vegetation provide protection from accelerated soil erosion, promote water infiltration, and contribute to soil nutrient cycling, plant and animal diversity, and to ecosystem function. Shrub cover is variable and depends on the TEUI unit. At the landscape scale, overall plant composition is similar to site potential (greater than 66 percent), but can vary considerably at fine- and mid- scales owing to a diversity of seral conditions. The seral state proportions contained in appendix E apply at the landscape scale, where low overall departure from reference proportions is a positive indicator of ecosystem condition.
- 5 In the lower elevation subtype, the fire regime is characterized by infrequent mixed-severity fires (Fire Regime III). In the upper elevation subtype, high-severity fires occur very

infrequently (Fire Regimes IV and V). Natural and human-caused disturbances are sufficient to maintain desired overall tree density, structure, species composition, spongy coarse woody debris, and nutrient cycling.

*Mid-Scale (10 to 999 acres)*

- 6 At the mid-scale, the size and number of groups and patches vary depending on disturbance, elevation, soil type, aspect, and site productivity. Patch sizes vary, but are mostly in the hundreds of acres, with rare disturbances in the thousands of acres. There may be frequent small disturbances, resulting in groups and patches of tens of acres or less.
- 7 Tree density ranges from 20 to greater than 250 square feet basal area per acre, depending upon disturbance and seral stages of the groups and patches. Snags 18 inches or greater at d.b.h. range from 5 to greater than 30 snags per acre, with the lower range of snags this size associated with early seral stages and the upper range associated with late seral stages. Density of snags 18 inches or greater at d.b.h. may be high in some locations because spruce beetles preferentially attach to large old trees. Snag density in general (greater than 8 inches d.b.h.) averages 20 per acre with a range of 13 to 30 and provides habitat for wildlife species and future downed logs. Coarse woody debris, including downed logs, averages vary by seral stage, ranging from 5 to 30 tons per acre for early seral stages; 30 to 40 tons per acre for mid-seral stages; and 40 tons per acre or greater for late-seral stages.
- 8 Mixed-severity (Fire Regime III) and high-severity (Fire Regimes IV and V) fires and other disturbances maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling.
- 9 Ground cover consists of shrubs, perennial grasses, and forbs depending on the unit in the TEUI. Grass, forb, and shrub interspaces created by disturbance may comprise up to 100 percent of the mid-scale area following major disturbances, depending on time since disturbance. Openings contribute to plant and animal diversity and ecological function.
- 10 Forest conditions in northern goshawk post-fledging areas are similar to general forest conditions except post-fledging areas typically contain 10 percent or greater tree density (basal area) than northern goshawk foraging areas and the general forest. Nest areas in Spruce-Fir have forest conditions that are multi-aged, but are dominated by large trees with relatively denser canopies than other areas.

*Fine Scale (less than 10 acres)*

- 11 Mid-aged to old trees grow tightly together with interlocking crowns. Trees are generally of the same height and age in early group/patch development, but may be multilayered in late development. Small openings ([gaps](#)) are present as a result of disturbances.

## **Alpine Tundra**

See appendix A, map 10.

### **General Description and Background for Alpine Tundra**

Alpine Tundra ERU covers approximately 939 acres within lands managed by the Coconino NF. It is found at the highest elevations within Kachina Peaks Wilderness and continues to the top of Humphreys Peak, the highest point in Arizona. This is the only area of Alpine Tundra and the

only area containing bristlecone pines located on National Forest System lands in Arizona; it is also one of the southernmost extents of Alpine Tundra in the continental United States.

Alpine Tundra consists of three main habitat associations: boulder fields, talus slopes, and alpine tundra meadows. Krummholz (areas of dwarfed, wind-twisted trees) occurs near tree line where trees transition to Alpine Tundra vegetation. This ERU typically has sparse vegetation including grasses, forbs, lichens, and low shrubs, and it supports a federally threatened plant—San Francisco Peaks ragwort—that is only found here, as well as other narrowly endemic plant species.

Primary natural disturbances are climate-related. Vegetation is controlled by temperature and the presence of soil, wind, snow accumulation, slope, and aspect. The dynamics of freeze-thaw cycles and wind give rise to unusual shapes of trees such as bristlecone pine and characteristic plant forms such as cushion plants. Episodic weather-related factors are the major natural disturbance processes and include extreme temperatures, solar radiation, high winds, avalanches, and moisture. Wildland fires and invasive or [noxious weeds](#) have had little to no effect on this habitat; however, off-trail recreation can trample plants and damage habitat.

Major human disturbances are developed recreation from the ski area and year-round dispersed recreation, mainly outside of winter. There is a popular trail leading to Humphreys Peak. A small portion (about 3 percent) of the Alpine Tundra ERU is infrequently disturbed by occasional snow avalanche control work.

The Alpine Tundra ERU is probably the most significant cultural area on the Coconino NF for many tribes in the Southwest.

### **Desired Conditions for Alpine Tundra**

FW-TerrERU-AT-DC

- 1 Alpine Tundra maintains the attributes and processes that contribute to the ecological diversity, habitat for native biota, and continues to be resilient to natural and human-caused impacts.
- 2 Alpine Tundra supports ecological communities typical of high elevations such as boulder fields, talus slopes, and meadows as well as an array of native species adapted to this harsh environment. It is able to support and sustain rare or narrowly endemic species and provides habitat for San Francisco Peaks ragwort, a federally listed species.

### **Guidelines for Alpine Tundra**

FW-TerrERU-AT-G

- 1 Recreational activities should be managed to maintain or improve ecological attributes, ecological processes, and habitat for native biota.

## **Wildland-urban Interface**

### **General Description and Background for Wildland-urban Interface**

The wildland-urban interface (WUI) includes residential areas and human developments having special significance at imminent risk from wildfire. Infrastructure that typically is considered part



of the WUI includes residential areas, critical communications sites, water-related facilities, high voltage transmission lines, power lines, dams, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.

### **Desired Conditions for Wildland-urban Interface**

#### **FW-WUI-DC**

- 1 Firefighters are able to safely and efficiently suppress wildfires in the WUI.
- 2 Human life and property are protected. There is reduced fire hazard, intensity, and severity to human health, safety, infrastructure, communication sites, water supply, astronomical sites, and characteristic ecosystem function.
- 3 In forested ecosystems, WUI conditions result in fires that burn primarily on the forest floor and rarely spread as crown fire. Ladder fuels are nearly absent and crown base heights may also be higher than non-WUI areas to reduce the likelihood of fire reaching the tree canopy.
- 4 The WUI may have a higher frequency of disturbance from prescribed burning, wildfires managed for resource objectives, and/or vegetative treatments than the natural disturbance regime.
- 5 Conditions in the WUI, such as live and dead fuel loading, tree basal area, logs, and snags, are on the lower end of the range given in vegetation community desired conditions.
- 6 In forested vegetation communities, the area occupied by interspace with grass/forb/shrub vegetation is on the upper end of, or above, the range given in the vegetation community desired conditions. Trees within groups may be more widely spaced with less interlocking of the crowns than desirable in adjacent forest lands. Interspaces between tree groups are of sufficient size to discourage isolated group torching from spreading as a crown fire to other groups.
- 7 Forests in the WUI are dominated by early seral, fire-adapted species growing in a more open condition than the general forest.
- 8 When WUI intersects ERUs with a mixed- or high-severity fire regime, such as Interior Chaparral, Pinyon Juniper Evergreen Shrub, Pinyon Juniper Woodland, Mixed Conifer with Infrequent Fire, Spruce-Fir, and some portions of Mixed Conifer with Frequent Fire, characteristic ecosystem function is modified to promote low-severity surface fires.
- 9 Dead and down fuel load is between 1 and 10 tons per acre, depending on ERU, with lower amounts in frequent fire ERUs, and higher amounts in infrequent fire ERUs such as Mixed Conifer with Infrequent Fire, Spruce-Fir, and portions of Mixed Conifer with Frequent Fire. This light fuel load provides improved fire protection to the WUI, yet still meets desired conditions. This light fuel load applies even in ERUs with higher reference fuel loads, such as Mixed Conifer with Infrequent Fire or Spruce-Fir.
- 10 Fuel loading or tree densities at the higher end of the range may occur in areas where it provides for important fine-scale habitat structure or cover, as long as it meets the overall intent of protecting WUI values at risk.

## **Guidelines for Wildland-urban Interface**

### **FW-WUI-G**

- 1 While still remaining within the range of desired conditions, forest structure in the WUI should have lower tree density and lower levels of snags, logs, and coarse woody debris than non-WUI areas and be arranged spatially to reduce fire hazard and to increase suppression success.

## **Management Approaches for Wildland Urban Interface**

Coordinate with residents living within and adjacent to the forest to provide information about wildfire protection of their homes and property, including creating defensible space.

## **Wildlife, Fish, and Plants**

### **General Description and Background for Wildlife, Fish, and Plants**

The wide range of habitats on the Coconino NF—extending from alpine tundra to lowland desert and including a variety of riparian ecosystems—creates a biologically rich landscape that supports a diversity of wildlife, fish, and plant populations. The forest is home to over 500 vertebrate species, including at least 300 species of birds; almost 100 species of mammals; a wide variety of amphibians and reptiles; 16 native fish species; invertebrates; as well as a variety of lichen, fungi, mosses, and plants. Habitats throughout the Coconino NF include the microclimate or smaller scale elements needed for animals and rare plants.

Species are primarily dependent on the condition of their habitats. The plan addresses species needs by providing guidance to maintain and/or enhance habitat elements that are important for species found on the forest, in addition to addressing threats specific to habitat and providing guidance for species-specific threats. Guidance to manage species is found in this section on Wildlife, Fish, and Plants, as well as in the sections of this plan that relate to their habitats and specific resources like recreation.

The relative health of some species' populations is related to habitat connectivity and safe passage to areas of suitable habitat such as between summer and winter range, across freeways, and along streamcourses. Some existing wildlife movement corridors have been identified within the forest boundary such as those along Woody Ridge, near Fort Valley and A-1 Mountain, and along busy highways. As landownership changes and people use increases, corridors can change and new ones may be identified, irrespective of landownership. Other species could negatively respond to connected habitats, such as some endemic species that developed in response to isolation.

Some species (or subspecies) have threats related to their habitat; some have threats related to management activities, and some species face threats simply by virtue of their relatively restricted distribution (including endemics, disjunct populations, or species at the edge of their range). Species (or subspecies) are considered to have a restricted distribution if they are limited in extent to the Southwest or to small portions of adjoining states or Mexico. A species or subspecies is considered to be endemic if it occurs in a very limited geographic area. Due to limited distributions and potential susceptibility to perturbations, some species may require specific management considerations.

Riparian areas make up less than 1 percent of the forest, yet are one of the most biologically diverse ecosystems. Riparian areas include streams, lakes, wetlands, and springs. Of the 11 national forests in the Southwestern Region, the Coconino NF has the second highest number of acres of lake habitat and the third highest number of miles of stream habitat. Stream ecosystems provide water, [forage](#), shelter, and habitat for nesting, roosting, and bedding, and are among the most important habitats for wildlife on the Coconino NF. Streams provide migration corridors important for birds and bats. Species that require water for part of their life cycle (that is, aquatic and semiaquatic species) on the forest are entirely dependent on these limited and scattered water sources. Nearly all of the native fish species and all three native leopard frogs on the Forest are either [federally listed](#) or Forest Service sensitive species. Two of the four most imperiled species in the Southwestern Region, spinedace and Little Colorado spinedace, occur in stream ecosystems on the forest. Additional federally listed and Forest Service sensitive species are supported by stream ecosystems such as the southwestern willow flycatcher and northern Mexican and narrow-headed garter snakes. The forest contains Fossil Creek, the only stream in Arizona with a large assemblage of native fish that is free of non-native fish and the last robust population of lowland leopard frogs on the forest.

The first bald eagle nest in Arizona was documented at Stoneman Lake in the late 1800s, and the largest concentration of bald eagles ever counted in Arizona (120 eagles) was documented in 1995, on the forest near Mormon Lake. Oak Creek, a tributary to the Verde River, supports the highest caddisfly species richness of any Arizona stream, containing more than one-third of all caddisfly species found in Arizona.

People enjoy high-quality hunting, fishing, and wildlife viewing on the Coconino NF. Nine of the 10 big game species in the state occur on the forest: black bear, bighorn sheep, elk, javelina, turkey, mountain lion, pronghorn, mule deer, and white-tailed deer. Buffalo (bison) is the only big game species that does not occur. Many of the state's small game species, such as Abert's squirrels, mourning doves, and cottontail rabbit, have abundant habitat on the Coconino.

Fishing opportunities are abundant. The Arizona Game and Fish Department manages sport fish species in the state, and the Coconino NF provides angling opportunities for many of these species in stream and lake habitats. Most sport fish species have been introduced to Arizona from elsewhere, although roundtail chub is a native sport fish. Gila trout were native to the Verde watershed on the forest, but have become extirpated in these locations.

The forest provides a unique opportunity to fish for native roundtail chub and headwater chub in portions of Fossil Creek. Wildlife viewing is one of the most popular recreational activities on the forest. There are a number of high-quality viewing areas, including four wildlife viewing areas identified in *Arizona Wildlife Viewing Areas* published by Watchable Wildlife, Inc. ([www.wildlifeviewingareas.com](http://www.wildlifeviewingareas.com)): Crescent Moon Picnic Area, Kendrick Park Watchable Wildlife Trail, Mormon Lake-Doug Morrison Overlook, and Upper and Lower Lake Mary. The forest has also partnered with other agencies in the Flagstaff area to form the Arizona Watchable Wildlife Experience, which has identified a network of watchable wildlife sites including many of those mentioned. The Important Bird Area Program is a global program founded by Birdlife International, and is overseen by the National Audubon Society in the United States. Important bird areas contain habitats that are important for the conservation of bird populations at one of three scales: global, continental, or state. The forest contains all or portions of five important bird areas. They are: Anderson Mesa, Lower Oak Creek, Mogollon Rim Snowmelt Draws, Salt and

Verde Riparian Ecosystem, and Tuzigoot. Anderson Mesa is a global level important bird area, and the other four are state-level important bird areas.

People also enjoy photography and aspen and wildflower viewing. Four botanical areas offer plant viewing: Fern Mountain Botanical Area, Verde Valley Botanical Area, Fossil Springs Botanical Area, and Cottonwood Basin Geological and Botanical Area.

### **Desired Conditions for Wildlife, Fish, and Plants**

#### **FW-WFP-DC**

- 1 Properly functioning ecosystems and ecologically responsible forest activities support sustainable populations of native plant and animal species distributed throughout their potential natural range. Properly functioning ecosystems reflect the diversity, quantity, quality, and site potential of natural habitats on the Forest. Habitat is available at the appropriate spatial, temporal, compositional, and structural levels for a wide variety of species.
- 2 Habitat conditions contribute to the survival and recovery of listed species, allow for repatriation of extirpated species, contribute to the delisting of species under the Endangered Species Act, preclude the need for listing new species, improve conditions for Southwestern Region sensitive species, and keep common native species common. Habitat conditions provide the resiliency and redundancy necessary to maintain species diversity and [metapopulations](#).
- 3 Terrestrial ERUs and riparian areas provide the necessary physical and biological habitat components for carrying out growth, reproduction, survival, dispersal, and other key life cycle needs of associated native species.
- 4 Stream ecosystem conditions within perennial and intermittent riparian streamcourses support habitat for self-sustaining populations of native aquatic and riparian species. Woody and herbaceous overstory and understory (where the natural potential exists) and overhanging banks provide fish habitat, regulate stream temperatures, and maintain soil moisture in the aquatic management zone. Stream substrates provide clean gravels for fish spawning, woody debris for hiding cover, and sites for germination and establishment of riparian vegetation. Abiotic structure such as silt, sand, gravel, cobble, boulders, and bedrock provide habitat for a variety of aquatic and terrestrial species.
- 5 The composition, structure and function of ERUs and associated physical elements (such as canyons, cliffs, caves, karst, talus slopes, rock piles, specific soil types, springs, wet areas, and other special features) provide functioning habitat and [refugia](#) to support populations of federally listed, Southwestern Region sensitive species, narrowly endemic species, and species with restricted distributions.
- 6 Interconnected terrestrial, riparian, and aquatic habitats promote wildlife, fish, and plant species movements and genetic exchange, allow for movement of wide ranging species, and promote natural predator-prey relationships, particularly for strongly interactive species (such as mountain lions). Species are able to access adjoining habitat, disperse, migrate, meet their life history requirements, and adjust their movements in response to climate change. Ephemeral and intermittent streamcourses function as habitat and movement corridors for species.

- 7 Forest attributes such as multistory structure; large, old trees; large trees with sloughing, exfoliating bark; snags; large downed logs; and other indicators of mature stands are present in all forest and woodland ERUs, providing habitat for the associated species.
- 8 Species populations are supported by their natural habitats. When natural habitats are unable to support species populations, active management and human-made or altered habitats support populations and meet conservation objectives.
- 9 Passage barriers are present in some streams when needed to physically separate native and non-native aquatic species.
- 10 Residents and visitors appreciate, learn, and have ample opportunities to experience, appreciate, and learn about the wildlife, fish, and plant resources of the Forest including vulnerable species such as native fish and migratory birds, charismatic species such as bald eagles and elk, and threats such as invasive species. Wildlife viewing or native sport fishing is emphasized where the opportunities exist. This results in increased forest stewardship, ecological awareness, partnerships, and volunteerism.
- 11 Activities, facilities, and uses are managed to have minimal human-wildlife conflicts.

### **Objectives for Wildlife, Fish, and Plants**

#### **FW-WFP-O**

- 1 Implement at least 20 activities that contribute to the recovery for federally listed species during each 10-year period over the life of the plan. An example of an activity could be thinning a Mexican spotted owl protected activity center to reduce the risk of uncharacteristic fire and to improve habitat conditions for prey species.
- 2 Implement at least 10 activities to benefit sensitive species that contribute to positive trends to avoid the need for listing during each 10-year period over the life of the plan.
- 3 Restore or enhance at least 60,000 acres of terrestrial wildlife habitat during each 10-year period over the life of the plan.
- 4 Restore or enhance at least 70 miles of stream habitat during each 10-year period over the life of the plan.
- 5 Complete at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan. Examples of products include: educational signs and brochures, website pages, species checklists, presentations, and field trips.

### **Standards for Wildlife, Fish, and Plants**

#### **FW-WFP-S**

- 1 Direction for species listed as threatened, endangered, proposed, or candidate takes precedence over direction for species not listed by the U.S. Fish and Wildlife Service.
- 2 Timing restrictions will be applied to projects and activities that have the potential to negatively affect federally listed species, bald eagles, and golden eagles to minimize or avoid impacts to survival or successful reproduction.

## **Guidelines for Wildlife, Fish, and Plants**

### **FW-WFP-G**

- 1** Habitat management objectives and species protection measures from approved recovery plans should be applied to activities occurring within federally listed species habitat to promote recovery of the species.
- 2** To improve the status of species and prevent Federal listing, management activities should comply with species conservation agreements, assessments, strategies, or national guidelines.
- 3** Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease.
- 4** Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical-free buffers could be placed around bat roosts, riparian or aquatic habitat.
- 5** Structural improvements should be planned and managed to provide wildlife with safe use of water, and to allow safe passage for wildlife prone to movement restrictions, such as pronghorn. For example, the bottom wire of fences should be smooth and at least 18 inches high to allow pronghorn passage.
- 6** Important wildlife movement corridors and pronghorn habitat should be generally free of impediments to movement caused by fences, so species can meet basic life history needs and access suitable habitat. For example, in these areas, construction of additional fences should be minimal, fence maintenance should be a priority, and fences that are no longer needed should be removed.
- 7** All open top vertical pipes with an inside diameter greater than 1 inch should be capped or otherwise designed to prevent animal entrapments. Examples of open top vertical pipes are pipe used for fences, survey markers, building plumbing vents, or sign posts.
- 8** Timing restrictions should be applied to projects and activities that potentially negatively affect Southwestern Region sensitive species and pronghorn. The intent is to minimize or avoid impacts to survival or successful reproduction.
- 9** Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and firefighter safety.
- 10** Projects and management activities should be designed and implemented to maintain refugia and primary life cycle needs of Southwestern Region sensitive species and to protect and provide for narrowly endemic species and species with restricted distributions where they are likely to occur.
- 11** Project-related activities with the potential to disturb active raptor nests should be restricted within a minimum of 300 yards of these nest sites to promote survival or successful reproduction.
- 12** Established protocols should be followed to prevent the introduction and spread of disease, such as chytrid fungus (*Batrachochytrium dendrobatidis*) that kills amphibians.

- 13 New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements, including fawning habitat for pronghorn.
- 14 To provide habitat while young northern goshawks are maturing, northern goshawk post-fledging family areas of approximately 420 acres in size should be designated surrounding nest areas. A minimum of six nest areas (known or replacement) should be located per territory and each nest area should generally be 25 to 30 acres in size. Northern goshawk nest and replacement nest areas should include known nests and generally be located in drainages, at the base of slopes, and on northerly (northwest to northeast) aspects. Nest areas and surrounding post-fledging areas should be delineated to include the best available northern goshawk habitat and generally comprise about 600 acres.
- 15 To maintain rare plant populations, seed collection and cuttings (rather than whole plant removal) should be the preferred collection methods when forest product and research collection permits are issued. An exception would be when whole plant removal is required to meet the needs of the permittee and removal would not have the potential to negatively impact rare plant populations. This guideline does not apply to pre-cleared areas for wilding permits of specific species.
- 16 Permits for cutting stalks off of agaves should not be issued in order to protect stalks used as nesting and overwintering habitat for key pollinators of desert ecosystems such as carpenter bees. Exceptions may be made for limited research purposes and traditional tribal uses.

### **Management Approaches for Wildlife, Fish, and Plants**

Coordinate with the Arizona Game and Fish Department, U.S. Fish and Wildlife Service, and the statewide Native Fish Conservation Team regarding maintenance of habitat for listed and native species; reintroductions, introductions, or transplants of species; control or eradication of non-native species; and the management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers. Coordination includes referencing current agency recommendations for improving wildlife habitat such as guidelines for wildlife-friendly fencing.

Coordinate with the Arizona Game and Fish Department, the U.S. Fish and Wildlife Service, sportsman groups, the scientific community—including the Rocky Mountain Research Station—and other stakeholders about information, education, and knowledge gaps as they relate to promoting and improving wildlife, fish, and plant resources and management. Education opportunities could include collaboration with research partners to provide student and volunteer participation in scientific studies.

Coordinate with the Arizona Game and Fish Department regarding the State Wildlife Action Plan as well as hunting recommendations for various wildlife populations that would lead to maintenance and improvement of habitat elements such as vegetation, aspen, riparian, and soil condition and productivity.

Place an emphasis on natural habitats. Consider active management of habitat when needed to support species populations and meet conservation objectives.

Use current literature and the best available science when making site-specific decisions relevant to project planning. This is done in an interdisciplinary context with input from other resource

specialists. For example; the guideline specifying disturbance buffers around raptor nests (FW-WFP-G-11) is intended as a minimum buffer. Some raptor species (such as osprey) are more adapted to disturbance and are likely to tolerate a buffer of just 300 yards during the breeding season while other, less tolerant species (such as peregrine falcons (*Falco peregrinus*)) may require buffers of up to one-half mile. Wildlife biologists work with other resource specialists to identify and define the appropriate site-specific buffers (within the context of plan guidance) for other raptors on a case-by-case basis.

The application of timing restrictions, like those referenced in FW-WFP-S-2 and FW-WFP-G-8, will be based on site-specific information and may vary depending on variables such as species, weather, timing of activity relative to species life cycle, or duration, frequency, and type of activities that are occurring in the species' habitat. Other variables to be considered could include the duration, extent, and intensity of the proposed activity, or the type of activity itself, such as emergency or safety-related actions versus non-emergency activities. The best available information and science is utilized to develop timing restrictions to reduce impacts to disturbance-sensitive species.

Work with Arizona Game and Fish Department, Arizona Department of Transportation, Arizona Wildlife Linkages Working Group, and others to identify linkages and barriers to wildlife movements and to mitigate such threats during project design.

Collaborate with the Federal Aviation Administration, airport administrations, air tour operators, military and government agencies, and other aircraft operators to minimize disturbances caused by aircraft over key wildlife areas during important times of their life cycle. Examples could include peregrine falcon nesting sites and big game wintering habitat.

Maintain the native-fish-only status of Fossil Creek and streams free of non-natives through public education, signs, and law enforcement.

## **Invasive Species**

### **General Description and Background for Invasive Species**

Executive Order 13112 defines an invasive species as any species that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species generally possess one or more of the following characteristics: aggressive and difficult to manage; poisonous; toxic; parasitic; a carrier or host of serious insect or pathogen; and being non-native, new, or not common to the United States or parts thereof. Invasive species pose an increasing threat to the integrity of ecosystems by decreasing native plant and animal diversity, increasing soil erosion and sedimentation, and interfering with natural fires regimes. Reducing the threat of aquatic and terrestrial invasive species will allow the Coconino NF to better manage resilient landscapes and species populations that have a greater capacity to survive natural disturbances and uncertain future environmental conditions such as those driven by climate change and increasing human uses.

Invasive species include aquatic and terrestrial vertebrates, invertebrates, plants, and pathogens. Priority infestations or populations have the greatest threats to native species populations, watershed condition, ecosystem health, and biological diversity.



### Desired Conditions for Invasive Species

#### FW-Invas-DC

- 1 Invasive species are absent or exist at levels where they do not disrupt ecological composition, structure, and function; do not disrupt the natural fire regime; or do not affect the sustainability of native and desirable non-native species.
- 2 Infestations of invasive species are detected at an early stage.

### Guidelines for Invasive Species

#### FW-Invas-G

- 1 Measures should be incorporated into authorized activities, project planning, and implementation to prevent, control, contain, and eradicate priority infestations or populations of invasive species to ensure the integrity of native species populations and their habitats is maintained.
- 2 [Integrated pest management approaches](#) and other treatments to control invasive species should be used to improve watershed condition and maintain ecosystem function while minimizing project impacts on native species.<sup>7</sup>
- 3 Weed-free plant material should be selected for all seeding and mulching projects to restore natural species composition and ecosystem function to the disturbed area. Plant or seed materials should be used that are appropriate to the site, capable of becoming established, and are not invasive.

### Management Approaches for Invasive Species

Maintain a current inventory of invasive species on forest lands. For plant inventories, prioritize areas of unique and rare habitats first, areas of high use and disturbance second (such as material pits, trailheads, campgrounds, corrals, roads, boat ramps, and bridges), and areas where invasive species are just getting established.

Prioritize areas such as wilderness, research natural areas, botanical areas, wild and scenic areas, and riparian areas for control of invasive species to maintain and restore the integrity of native species and ecosystems. Promote early detection of new populations of invasive species and rapid management response as an effective approach to minimize spread.

Coordinate with stakeholders and the public to reduce, minimize, or eliminate the potential introduction, establishment, spread, and impact of non-native invasive species and to monitor the effectiveness of project design features.

Encourage the prevention of accidental introduction and spread of invasive species carried by contaminated vehicles, equipment, personnel, or materials (including plants, wood, plant/wood products, water, soil, rock, sand, gravel, mulch, seeds, grain, hay, straw, animal feeds, or other materials).

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<sup>7</sup> See “Design Features, Best Management Practices, Required Protection Measures and Mitigation Measures” in the “Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds” (USDA Forest Service 2005).

## Fire Management

### General Description and Background for Fire Management

Wildland fire is any non-structure fire that occurs in vegetation or natural fuels. Wildland fire includes prescribed fires ([planned ignitions](#)) and wildfires. Wildfires include either unplanned human-caused fires or naturally caused fires. Wildfires may be concurrently managed for one or more objectives. Objectives are developed based on fuel conditions, current and expected weather, current and expected fire behavior, topography, resource availability, and values at risk. Objectives are also influenced by social understanding and tolerance, and adjoining governmental jurisdictions.

Objectives can change as the fire spreads across the landscape. Parts of a fire may be managed to meet protection objectives, while other parts are managed to maintain or enhance resources (wildfires managed for resource objectives). Site-specific analysis is conducted for prescribed fires and for any wildfire that extends beyond initial attack. For prescribed burns, the decision document is the signed [National Environmental Policy Act](#) (NEPA) decision. For wildfires, an analysis is performed using a tool like the Wildland Fire Decision Support System, and signed by the appropriate line officer.

Most of the vegetation on the Forest is adapted to recurrent wildland fires started by lightning from spring and summer thunderstorms. Fire plays a vital role in maintaining ecosystem health. Properly managed prescribed fire and wildfire are tools for maintaining and/or restoring vegetative composition, structure, and function where fire is a primary natural disturbance.

### Desired Conditions for Fire Management

FW-Fire-DC

- 1 Public and firefighter safety is the highest priority in managing fire.
- 2 Wildland fires burn within the historic fire regime of the vegetation communities affected. High-severity fires occur where this is part of the historical fire regime and do not burn at the landscape scale.
- 3 Wildland fires do not result in the loss of life, property, or ecosystem function.
- 4 People understand that wildland fire is a necessary natural disturbance process integral to the sustainability of the ecosystems in which fire is the primary disturbance.

### Guidelines for Fire Management

FW-Fire-G

- 1 WUI areas should be a high priority for fuels reduction and maintenance to reduce the fire hazard.
- 2 Fire management activities should be designed to be consistent with maintaining or moving toward desired conditions for other resources.

### **Management Approaches for Fire Management**

Manage wildland fires forestwide for multiple resource management objectives<sup>8</sup> where conditions permit.

Integrate fire with other management tools to treat and restore vegetative composition, structure, and function in ecosystems where fire is a primary natural disturbance.

In all ROS classes and in wilderness, prescribed fire and wildfires managed for resource objectives can be appropriate tools to treat and restore vegetative composition, structure, and function where fire is a primary natural disturbance.

Coordinate with other jurisdictions such as communities, service providers (infrastructure), and Federal, State, county, and local entities regarding prevention, preparedness, planned activities, and responses to wildland fires. Notify the above regarding the upcoming and ongoing fire season and any prescribed fire activity.

Coordinate access for initial attack and suppression activities with responsible jurisdictions to reduce response times and address public and firefighter safety.

Encourage the development and implementation of community wildfire protection plans to promote public safety and to reduce the risk of wildfire on lands of other ownership.

Coordinate with stakeholders to increase public understanding of the necessity of wildland fire as a process integral to the sustainability of the vegetation communities in which fire is a primary natural disturbance.

### **Livestock Grazing**

#### **General Description and Background for Livestock Grazing**

Livestock grazing has occurred on the Coconino NF since the 1870s. Large herds of sheep and cattle grazed the area in the 1880s and 1890s. Livestock management began with the creation of the Forest Reserves in the 1890s and the Coconino NF in 1908. Grazing allotments were laid out at that time. In the 1930s, allotments were fenced to prevent unauthorized grazing. Since then, pastures within allotments have been fenced to facilitate grazing rotation. During World War II and in the years following, substantially more livestock was permitted to graze on the forest than today, and there were many more ranchers with permits on the forest. Since then, allotments have been combined into larger units, and now, there are fewer allotments and fewer ranchers permitted to run livestock. There is a correspondingly lower number of livestock on the forest than was permitted in the past.

#### **Desired Conditions for Livestock Grazing**

FW-Graz-DC

- 1 There are opportunities to engage in ranching activities and graze livestock on National Forest System lands. These activities contribute to the stability and social, economic, and cultural aspects of the communities in central and northern Arizona.

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<sup>8</sup> “Objectives” are used here in a general sense and do not refer to objectives that are plan components.

- 2 Permitted livestock grazing is consistent with the desired conditions of other resources. However, conditions immediately adjacent to livestock concentration areas, such as earthen stock ponds, developed springs, and other features that concentrate livestock, may be inconsistent with general desired conditions for vegetation and soil such as lower levels of vegetation and higher levels of [soil compaction](#).
- 3 Grasses and forbs provide forage for permitted livestock.

#### **Standards for Livestock Grazing**

FW-Graz-S

- 1 Troughs and uncovered storage tanks shall incorporate animal escape devices.

#### **Guidelines for Livestock Grazing**

FW-Graz-G

- 1 Grazing and browsing use by authorized livestock and wildlife should be in balance with available [forage production](#).
- 2 Livestock grazing should be managed to meet, or move toward, the desired conditions for forest resources such as soil, water, vegetation, and species.
- 3 Burned or mechanically treated areas should be given sufficient rest from livestock grazing, especially during the growing season, to ensure plant recovery and vigor and to ensure that perennial plants would not be permanently damaged by grazing. Grazing should not be authorized in burned or mechanically treated areas until Forest Service specialists determine plant recovery and vigor in the burned or treated area by considering characteristics such as seed heads or flowers, multiple leaves or branches, and/or a root system that does not allow them to be easily pulled from the ground. These characteristics provide evidence of plant recovery, vigor, and reproductive ability.
- 4 Structural range improvements (such as fences, troughs, earthen stock ponds, pipelines) should be located, constructed, reconstructed, maintained, and used in a manner consistent with the desired conditions for riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other [sensitive resources](#). Range improvements should be modified, relocated, or removed when found incompatible.
- 5 Salt, minerals, and/or other supplements should be located and used so that sensitive resources are protected from excessive trampling, compaction, salinization, and other impacts. For example, these supplements should be located at least a quarter of a mile from riparian areas, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other sensitive resources.
- 6 Gates in waterlot fencing should be left open to wildlife except when controlling livestock distribution.
- 7 Where permitted livestock have access to riparian areas, the use of riparian species should provide for maintenance of those species, allow for regeneration of new individuals, protect bank and soil stability, and reduce the effects of flooding. Maintenance of woody riparian species should lead to diverse age classes of woody riparian species where potential for native woody vegetation exists. This guideline would not apply to fine-scale activities and

facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to minimize impacts to riparian areas at a larger scale.

- 8 Measures should be used to minimize the risk of association and provide effective separation between permitted domestic sheep and goats and wild bighorn sheep to prevent the transfer of disease from permitted domestic sheep and goats to wild sheep.
- 9 Converting grazing allotments from cattle to domestic sheep should not be considered within occupied bighorn sheep habitat to prevent the spread of disease between domestic and wild sheep populations. As opportunities arise, allotments near occupied bighorn sheep habitat should be considered for conversion from domestic sheep grazing to cattle grazing in cooperation with affected parties.

### Management Approaches for Livestock Grazing

Collaborate with permittees, tribes, educational institutions, other agencies, and stakeholders in achieving and maintaining desired conditions, including invasive species management.

Collaborate and communicate with permittees to facilitate ecologically and economically sustainable rangeland management, livestock grazing practices, and ecosystem goods and services.

Regularly review active [allotment](#) management plans.

When selecting and installing escape devices, consider devices made of long-lasting and grip-able materials that can be firmly attached to and meet the sides of the water development, and extend down to the bottom or lowest expected water level.

Consider establishing [forage reserves](#) to improve flexibility and balance between restoring fire-adapted ecosystems and range management.

When developing Annual Operating Instructions for [grazing permit](#) holders, consider the need for motorized travel off the designated road system and off-road to carry out required management practices necessary to comply with the terms and conditions of the Term Grazing Permit. Examples of required management practices include, but are not limited to: the repair and maintenance of structural range improvements; transport and placement of mineral or protein supplement; and tending to sick or injured animals.

## Forest Products

### General Description for Forest Products

National Forest System lands were established with the intent of providing goods and services to satisfy public needs over the long term, which includes the production of a sustainable supply of forest products.

Forest products fall into three categories: (1) timber, (2) special forest products, and (3) forest botanical products. Timber products include firewood, wood pellets for home and industrial heating, structural panels, animal bedding, wood molding, pallets, structural lumber, posts and poles, sawtimber, pulpwood, non-sawlog materials removed in log form, cull logs, small roundwood, house logs, and biomass for electricity. Special forest products include bark, berries, boughs, bryophytes (nonvascular plants such as mosses), bulbs, burls (deformed tree growths),

cactus, Christmas trees, cones, ferns, firewood, forbs, fungi (including mushrooms), grasses, nuts (including pinyon nuts), pine straw, roots, sedges, seeds, transplants, tree sap, wildflowers, fence material, mine props, posts and poles, and rails. Forest botanical products are a subset of special forest products, but exclude timber products such as Christmas trees, firewood, fence materials, mine props, rails, posts, and poles. Forest products do not include rocks, minerals, animals, animal parts, insects, worms, soil, or water.

### **Desired Conditions for Forest Products**

#### FW-FProd-DC

- 1 The Coconino NF provides a sustainable supply of forest products consistent with other resource desired conditions and applicable laws and regulations. This supply contributes to the stability and social, economic, and cultural aspects of the communities in central and northern Arizona.
- 2 Silvicultural treatments for forest products reflect natural disturbance regimes and contribute to ecosystem sustainability. Silvicultural timber cutting techniques integrate considerations for socioeconomic values, water quality, soils, wildlife habitat, recreation opportunities, visual quality, and other values, while providing opportunity for a sustainable and appropriately scaled industry.
- 3 Traditional and ceremonial tribal uses for forest products, such as the collection of medicinal plants, wild plant foods, basketry materials, kiva beams, and firewood, are available under conditions and procedures that minimize restrictions and are consistent with laws, regulations, and agreements with tribes.

### **Standard for Forest Products**

#### FW-FProd-S

- 1 No harvest for purposes of [timber production](#) shall occur on lands not suited for timber production.

### **Guidelines for Forest Products**

#### FW-FProd-G

- 1 Timber harvest activities should be designed to be consistent with maintaining or moving toward ecological/social desired conditions.
- 2 Harvesting systems should be selected based on their ability to meet desired conditions and not on their ability to provide the greatest dollar return.
- 3 Collection of forest products should be authorized only when information is available to ensure the product will persist on the forest.
- 4 Plant species recognized as rare, limited in distribution, or on the Southwestern Region's sensitive species list should not be collected unless the forest has information that the species can withstand collection and will persist on the forest. Research collection requests should be considered when the results of the research will aid management of the collected species.

### **Management Approaches for Forest Products**

Work with agencies, private organizations, and individuals to promote forest product use when forest products are available as a result of forest management activities.

Encourage use of forest products in lieu of onsite burning or chipping.

Ensure the continued sustainability of special forest products through observation of commercial sales and personal use permit harvest levels.

Recognize the needs of members of tribes whose historic ties include the land now administered by the Coconino NF to collect forest materials for traditional, ceremonial, and subsistence purposes.

Work with tribal members to facilitate collection of forest products needed for traditional activities and ceremonial uses.

Encourage the use of forest products to reduce or soften the scenic impacts of utility and transportation corridors.

### **Mineral Resources**

#### **General Description and Background for Mineral Resources**

Mineral resources on the Coconino NF fall into three legal and regulatory categories: (1) [locatable minerals](#) under the 1872 Mining Law, which include hard rock minerals like gold, silver, and other metals and which are subject to claim staking; (2) [salable \(permitted\) mineral](#) activities such as sand, gravel, and common building stone; and (3) [leasable minerals](#) which includes geothermal resources and oil and gas. The Forest Service and the Department of Interior's Bureau of Land Management (BLM) jointly share authorities to administer and manage the exploration and development of Federal mineral and energy resources on the forest, with the exception of salable (common variety) minerals. The Forest Service has sole responsibility for salable minerals. The Forest Service is responsible for managing the occupancy and use of the surface resources by individuals and companies conducting locatable and leasable mineral activities. Leasable mineral activities proposed on the forest generally require some form of consent of the Forest Service to the BLM, and are subject to prescribed conditions to ensure adequate resource protection and [utilization](#) of the lands for the purposes for which they were acquired or are being administered. Several areas across the forest have been withdrawn from mineral entry, subject to valid existing mineral rights. The withdrawal from the Mining Law only affects the staking of new claims in the area. Claims that pre-date the withdrawal, if they have valid existing rights, are not affected.

#### **Desired Conditions for Mineral Resources**

FW-Minerals-DC

- 1 Mineral and mining activities meet the legal mandates to facilitate the development of minerals on the Coconino NF in a manner that minimizes adverse impacts to surface and groundwater resources, and that do not detract from maintaining or meeting other desired conditions applicable to the area.

- 2 [Mineral materials](#) are available to Federal, State, county, and city agencies where feasible, and consistent with other resource values.

### **Standards for Mineral Resources**

#### FW-Minerals-S

- 1 Mineral operations and activities shall avoid or mitigate impacts to archaeological sites or places of cultural importance to American Indian tribes that have been determined to be eligible or may be eligible for the [National Register of Historic Places](#).

### **Guidelines for Mineral Resources**

#### FW-Minerals-G

- 1 To protect social, cultural, and ecological values and where management direction is not compatible with mineral development, the following areas should be considered for withdrawal for locatable minerals:
  - Properties with a substantial Forest Service investment in facilities such as [administrative sites](#) and campgrounds.
  - Traditional cultural properties where historic preservation laws alone do not adequately protect the cultural resource.
  - Established research natural areas not located in wilderness.
  - Geological areas and botanical areas not located in wilderness.
  - Habitat of species having a very limited range and specific habitat requirements not found elsewhere where law and regulation alone do not adequately protect the resource.
- 2 As existing [mineral withdrawals](#) approach expiration, the forest should begin the mineral withdrawal process by submitting a new segregation application. This would only occur if it is determined that a mineral withdrawal is the only way to protect identified social, cultural, and ecological surface resource values, and current law and the locatable surface use regulations do not provide adequate protection.
- 3 To protect social, cultural, and ecological values, the following areas should be considered for [no surface occupancy](#), no leasing, or other leasing stipulations for leasable minerals in:
  - Designated and eligible wild and scenic rivers.
  - Research natural areas not located in wilderness.
  - Geological areas and botanical areas not located in wilderness.
  - The [foreground](#) of State scenic roads, national All-American roads, and national trails.
  - Areas of very high scenic integrity not located in wilderness, designated and eligible wild and scenic rivers, or other withdrawals.
  - San Francisco Peaks/Mount Elden Recreation Area withdrawal.
  - Areas of very high archaeological site density (greater than 60 sites per square mile) and potentially eligible for the National Register of Historic Places.
  - Areas with federally threatened or endangered, or Forest Service sensitive species.



- Traditional cultural properties where historic preservation laws alone do not adequately protect the cultural resource.
- 4 Important wildlife and plant habitats, visually sensitive areas, archaeological sites, places of cultural importance to American Indians, and areas with large capital investments should be protected through surface occupancy restrictions, mitigation measures, and operating plan requirements imposed on mineral activities.
  - 5 Past and present mining operations should be reclaimed to provide for public safety and to minimize impacts to cultural and natural resources.

### **Management Approaches for Mineral Resources**

Consider withdrawing congressionally designated areas from entry and operations for locatable minerals (or other approaches) if withdrawal was not a part of the establishing legislation for the designated area. Prioritize mineral withdrawals where mineralization poses the most risk.

Incorporate BMPs and stipulations into future leases as appropriate to the location from the “Final Programmatic Geothermal Leasing Programmatic Environmental Impact Statement for Geothermal Leasing in the Western U.S.” (USDI Bureau of Land Management and USDA Forest Service 2008) or more current direction.

Ensure mineral materials are available for administrative needs before considering requests for non-administrative uses.

## **Heritage Resources**

### **General Description and Background for Heritage Resources**

Heritage resources are buildings, sites, areas, architecture, memorials, and objects having prehistoric, historic, or social values.

The Coconino NF has some of the highest archaeological site densities in the Southwest. Archaeological sites on the forest represent 12 prehistoric and 10 historic/modern cultural traditions ranging from the Clovis period of the Paleoindian tradition to historic and recent sites of the Hopi, Navajo, Yavapai, Apache, Basque, Mexican, and Euro-American cultures. Most of the sites representing the prehistoric Sinagua tradition are contained within the forest. Sites of the prehistoric Cohonina tradition and the Archaic period are also quite abundant, but are found outside of the forest as well.

One of the ways national historic significance is recognized by the Federal Government is through placement on the National Register of Historic Places. About 2,700 sites on the Coconino have been determined to meet the criteria of eligibility for the National Register of Historic Places, meaning they are considered culturally important because they are associated with important events or important people, are an outstanding example of a type of site or architecture, or have the potential to contribute important information to history or prehistory. One hundred fifty-nine sites of particular significance have been listed on the National Register, either individually or as part of six National Register districts.

Another way national historic significance is recognized is through designation of sites as National Historic Landmarks. Ten sites are within the two National Historic Landmarks on the Forest. One of these sites is the C. Hart Merriam Base Camp and the other nine are within the

Winona Village National Historic Landmark. Merriam's significant life zones concept was conceived in 1889, while he studied the different vegetation zones on the San Francisco Peaks. Winona Village is a complex of sites that was partially excavated in the 1930s, and it was the basis for many of the archaeological concepts for the prehistory of the Flagstaff area.

Several tribes, particularly the Hopi and Zuni, recognize many of the sites on the forest as ancestral villages, where many of the ceremonies and traditions of their cultures originated. Pilgrimages to some of these sites are still made, with offerings of prayers and other objects.

The recreational, educational, cultural, and scientific values of the archaeological sites on the forest have been recognized as a recreational and scientific niche that the forest can provide to the public. Understanding the scientific, cultural, and educational values of individual site types can provide a better basis for allocating them to management categories and for prioritizing them for scientific study, development, and preservation. Promoting and developing that niche, while protecting and respecting cultural and scientific values through research and conservation, is a goal of the heritage program of the Coconino NF.

### **Desired Conditions for Heritage Resources**

FW-Hrtg-DC

- 1 Historic and prehistoric sites, including known American Indian sacred places and traditional cultural properties, are preserved and protected for their cultural importance.
- 2 Site integrity and stability are protected and maintained on sites that are susceptible to imminent risks or threats, or where the values are rare or unique.
- 3 Conservation and preservation efforts maintain site significance and integrity. Site eligibility is not impacted by visitors. [Priority heritage assets](#), the Coconino NF's cultural resource "crown jewels," are all stable and their significant values are protected.
- 4 Vandalism, looting, theft, and human-caused damage to heritage resources are rare.
- 5 Cultural and scientific values are continually enhanced through research and partnerships with tribes, universities, and museums. Interpretation and public involvement in archaeological activities increases appreciation and respect of cultural values and fosters a sense of stewardship for our common heritage.
- 6 Archaeological collections and associated records are curated at museums, organizations, and other institutions that meet professional standards for the purpose of scientific research, public education, and interpretation.
- 7 Heritage resources provide educational opportunities that connect people, past and present, to the land and its history. Public enjoyment is enhanced by opportunities to visit interpretive heritage resource sites. Interpretation of the human history of the Coconino NF promotes greater public understanding and appreciation of the prehistoric and historic cultures and communities that have depended on this landscape for their livelihood, recreation, and spiritual well-being and provides connections between prehistoric, historic, and modern people.
- 8 At developed cultural interpretive sites, on-site personnel, interpretation and personal interaction provide educational opportunities for visitors to learn about and appreciate prehistoric and historic cultural resources.

- 9 Archaeological site etiquette information is readily available to national forest visitors.
- 10 Heritage-based recreation opportunities are connected, where practical, with other recreation opportunities. In some cases, historic routes (such as railroad grades, General Crook Trail, Beale Wagon Road) are used for recreation trails with interpretation of their history and some historic features. In addition, historic structures are made available to the public through the cabin rental program.
- 11 Opportunities exist for volunteers to participate in heritage resource conservation activities such as research, site stabilization, conservation, and interpretation.
- 12 Heritage programs, interpretive presentations, publications, and interactive learning opportunities are available to provide the public with opportunities to learn about, understand, and experience the Coconino NF's prehistory and history.
- 13 Cultural resource findings are synthesized and shared with the scientific community and public through formal presentations, publications, and educational venues. The Forest Service actively contributes toward addressing heritage and current issues of local, regional, and national significance.
- 14 The forest's historic documents (such as photographs, maps, records) are available to the public for approved research and interpretation.

### **Objectives for Heritage Resources**

FW-Hrtg-O

- 1 Complete an analysis of at least three study units or site types during each 10-year period over the life of the plan to determine their rarity or ubiquity, potential significance for a range of archaeological questions, information gaps, and cultural values.
- 2 Non-project-related archaeological surveys are conducted in areas of moderate to very high archaeological site density on 1,000 acres during each 10-year period over the life of the plan.

### **Guidelines for Heritage Resources**

FW-Hrtg-G

- 1 Primary archaeological site and survey records should be maintained and updated on the Coconino NF. Associated records may be shared and maintained at institutions that meet professional standards (such as 36 CFR 79, American Museums Association accreditation) and have research interests on the forest.
- 2 Heritage-based interpretive sites should be managed to enhance the public's understanding of the resource, protect and preserve the resource, and be consistent with tribal interests to protect the cultural setting of the site and visitor experiences.
- 3 Sites should be stabilized to preserve and maintain their information potential and significant values.
- 4 Unplanned user-created trails that lead to archaeological sites should be eliminated to protect sites from damage and looting.

- 5 Heritage interpretive sites, standing structures, and other materials, should be managed to develop visitor appreciation for the region's history and to develop visitor awareness of preservation efforts.
- 6 Through consultation with those tribes who are descendants of the prehistoric people or with groups that have associations with the area in historic times, historic and prehistoric sites should be managed to prevent or minimize adverse impacts.
- 7 Collection of archaeological items should only occur when necessary to mitigate project impacts, when objects of notable scientific or educational value are encountered, or when there is a substantial risk that an item will be stolen if left on site.

### **Management Approaches for Heritage Resources**

Maximize opportunities for partnerships and volunteerism in all heritage program elements. Cooperate with local, State, and private agencies, institutions, and local tribes in accomplishing program goals and objectives.

When conducting analysis on study units or site types, provide guidance on evaluating the significance of individual sites within that study unit or site type. Use these analyses to periodically update the forest's [Cultural Resources Overview](#).

Periodically update the Cultural Resources Overview as archaeological study units are defined and [property classes](#) are analyzed. The purpose is to synthesize information and the role of the Coconino NF to local, regional, national and international heritage issues. This overview provides the context for all management activities related to heritage resource. It contains a prioritized list of sites that need stabilization or documentation in order to be preserved to maintain their information potential and significant values. Focus is on Priority Heritage Assets and sites at risk from vandals, natural conditions, and structural instability. Monitoring of sites is prioritized in high visitation areas such as near roads, campgrounds, and trails. Prioritize sites for their ability to contribute to significant research issues at local, national, and international levels.

The Cultural Resources Overview divides the Coconino into archaeological study units (geographic areas that are meaningful units of analysis with which to examine and interpret the prehistory of that area) and site types (such as field houses, flaked stone scatters, small pueblos, large pueblos, pit house clusters, and rock art that have cohesiveness and can be studied as individual classes and/or can be compared between archaeological study units). When planning and implementing property class surveys, give priority for identification and documentation to site types that are most subject to damage by expected project activities. Wooden structures and rock art, for example, can be more seriously damaged by fire-related activities than other site types.

Base National Historic Preservation Act Section 110 survey and site stabilization requirements on the findings of the archaeological study units' analyses. Surveys and stabilization reflect current archaeological issues at local, national, and international levels.

Work with partners such as the American Indian tribes, Arizona Site Stewards program, Arizona Archaeological Society, National Park Service, and Museum of Northern Arizona to identify, study, protect, and monitor sites and artifact collections.

Protect cultural and biological resources in the vicinity of Hartwell Canyon through partnerships and collaboration with organizations such as The Nature Conservancy and The Archaeological Conservancy.

Achieve a balance between activities that ensure historic resource management projects are in compliance with legal requirements to evaluate and protect archaeological sites (National Historic Preservation Act Section 106) and activities that focus solely on the cultural resources themselves (National Historic Preservation Act Section 110) by:

- Inventorying, studying, documenting, and preserving sites; and
- Conducting a program of “public archaeology” to educate and inform people about heritage resources through site interpretation and hands-on involvement in the archaeological process.

Prioritize site stabilization and restoration work based on the relative importance, information potential, tribal concerns, and uniqueness of a site. Conduct and document monitoring after sites have been stabilized. Plan and perform maintenance before it becomes critical<sup>9</sup> to the condition of a site.

Develop agreements with forest-approved repositories to curate records and artifacts. Periodically inspect collections and repository facilities to ensure they continue to meet professional standards.

Consider including curation costs for projects that include collection of artifacts.

Retain historic documents at Forest Services offices. Maintain electronic records, including maps, letters, and other documents of historic importance. Maintain an annotated index of historic photographs and documents that briefly describes the image or content of each item.

Consider scanning and indexing primary site records, survey records, photographs, and historic records for use, with primary records receiving archival care. Develop protocols for accessing digital information. Consider making provisions for curation of materials confiscated from Archaeological Resources Protection Act of 1979 part of the resolution of legal cases.

Minimize the need for onsite staffing by emphasizing “self-discovery” developments. Develop interpretative messages on individual responsibility to protect forest resources, with specific messages targeted to children. Consider tribal interests when planning interpretive projects.

Cooperate with private industry, museums, secondary schools, universities, organizations, and other Federal, State, and local governmental agencies to provide for heritage tourism that enhances the overall experience of visitors to the Coconino NF, results in preservation and protection of heritage resources and their setting, and is consistent with tribal interests and desires.

Encourage partnerships with American Indians, commercial ventures, volunteers, museums, and universities for documenting, preserving, interpreting, and managing sites and to evaluate and develop creative management opportunities.

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<sup>9</sup> Critical deferred maintenance is defined as a potential health or safety risk or imminent threat of loss of significant resource values (Forest Service Manual 2360.5).

Partner with the Rocky Mountain Research Station on use of the station as recreation, education opportunities, collection, and displays with respect to Fort Valley Experimental Forest, a site listed on the National Register of Historic Places.

## **Tribal Relations and Uses**

### **General Description and Background for Tribal Relations and Uses**

American Indian tribes have lived for centuries on the land that is now the Coconino NF, and the Forest Service recognizes and respects those relationships to the land. Some tribes consider the prehistoric sites to be the homes of their ancestors or recognize particular sites and places to be of historical, cultural, and religious significance. The Forest Service and federally recognized American Indian tribes have a special and unique government-to-government relationship (one sovereign nation to another) based on the U.S. Constitution, treaties, and statutes. The Coconino NF is adjacent to the Yavapai-Apache Nation near Camp Verde and is about 6 miles from the Navajo Nation Reservation boundary. The forest regularly consults with 13 American Indian tribes: Fort McDowell Yavapai Nation, Hopi Tribe, Hualapai Tribe, Havasupai Tribe, Navajo Nation, Pueblo of Acoma, Pueblo of Zuni, San Carlos Apache Tribe, San Juan Southern Paiute Tribe, Tonto Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Tribe, and the White Mountain Apache Tribe.

### **Desired Conditions for Tribal Relations and Uses**

FW-Trbl-DC

- 1** The Coconino NF recognizes American Indian needs and viewpoints and fosters a robust relationship with federally recognized American Indian tribes and related groups with which it consults. In addition to the official tribal government with which Federal agencies are required to consult, forest personnel also consult and talk with tribal historic preservation officials, traditional religious practitioners, tribal members, and other tribal organizations. The Coconino NF tribal consultation process notifies tribes about proposed activities on the forest that may be of interest, encourages face-to-face dialogue about proposed activities that are of interest, and provides information about how tribal input received during consultations is used in decision-making processes. The Coconino NF consultation processes and tribal interactions are compatible and consistent with its neighboring national forests.
- 2** Tribal practitioners have access to areas that provide them an opportunity to practice traditional activities, such as plant gathering and ceremonial activities that are essential in maintaining their cultural identity and the continuity of their culture, with reasonable limitations, consistent with public safety and multiple uses by other forest users. There are opportunities for solitude and privacy for ceremonial activities.
- 3** Forest products used by tribal members, organizations, and communities with ancestral or historic ties to the Coconino NF are available for traditional practices and are sustained over time. Collection of culturally important plants by American Indians does not negatively affect the presence and distribution of those species on the forest.
- 4** The forest provides a setting for the education of tribal youth in culture, history, and land stewardship and for the exchange of information between tribal elders and youth.

## Guidelines for Tribal Relations and Uses

FW-Trbl-G

- 1 Through discussions with American Indian tribes that collect plants for traditional cultural and ceremonial purposes, forest projects and activities should be designed to promote the persistence of culturally important plants.
- 2 The forest should work with tribes to identify traditional cultural properties so those areas and cultural values can be preserved, restored, or protected from impacts by forest activities and public visitors.

## Management Approaches for Tribal Relations and Uses

The Coconino NF and area tribes have a mutual interest in maintaining healthy, sustainable populations of plants and other resources important for traditional and cultural purposes. Work with area tribes to identify, collaboratively manage, and monitor these resources, as well as build and maintain more detailed information about culturally important plants. Continue to manage the land in a spirit of shared stewardship with the tribes.

Recognize the importance of a strong relationship with American Indian tribes and groups, and ensure Coconino NF personnel continuously cultivate those relationships. Meet regularly with consulting tribes to better understand their needs and viewpoints and consult with them in the management and interpretation of cultural sites. Enhance tribal relationships and communications through volunteer opportunities with tribal members. In addition, consider formally designating one person as a tribal relations coordinator to facilitate the tribal consultation process and maintain a record of tribal consultations.

Develop memorandums of understanding between the forest and those consulting American Indian tribes with which a memorandum of understanding does not currently exist to guide consultation processes and reflect the tribes' particular perspectives and interests.

Work with neighboring forests and local tribes to develop a consistent forest products collection policy and tribal firewood program for use on the respective national forests.

Provide training to forest employees about the trust responsibilities Federal agencies have for tribes and the specific ways in which the Coconino NF honors and implements those responsibilities.

Provide training to forest employees about interactions with tribal members engaging in traditional land uses, in a manner that fosters mutual trust and respect.

## Roads and Facilities

### General Description and Background for Roads and Facilities

#### *Roads*

The Coconino NF transportation system road network consists of thousands of miles of arterial, collector, local, and closed roads ranging from maintenance level 1 (closed to all [motorized uses](#)) to maintenance level 4 (smooth surface that provides a moderate degree of user comfort and convenience at moderate travel speeds). The road system provides access to areas on the

Coconino NF including private land, recreational opportunities, research sites, facilities, and to support forest and resource management.

### *Facilities*

The forest manages administrative [facilities](#) and sites for a variety of purposes, from office buildings and storage facilities to lookout towers and fire facilities. The forest uses administrative facilities and sites for the implementation and management of the natural resource.

## **Desired Conditions for Roads and Facilities**

FW-RdsFac-DC

### *Roads*

- 1 The transportation system (roads) provides reasonable motorized access to the public, city, county, State, and other Federal entities for permissible uses such as recreation, fire management, wildlife management, and access to infrastructure or neighboring land. The transportation system expands and contracts commensurate with use and needs, and it balances the desire for access with management activities and ecological impacts. An economical system of sustainable, well maintained, and marked roads provides diverse opportunities to explore the forest while protecting watershed conditions, recreation opportunities, scenery, heritage resources, rare plants, fisheries, and wildlife habitat and movement. However, the transportation system does not necessarily provide for user comfort or all-weather access on all roads.
- 2 Road corridors and associated infrastructure (including those under easement or permit) are designed, constructed, and maintained to provide safe access while maintaining and meeting other desired conditions applicable to the area.
- 3 Temporary increases in roads are appropriate for projects associated with watershed protection and restoration. Temporary roads that support ecosystem restoration activities, fuels management, or other short-term projects are rehabilitated promptly after project completion.
- 4 The minimum road system necessary for public, administrative, and private access within areas that affect water supplies, such as the Inner Basin, C.C. Cragin Reservoir, and Upper and Lower Lake Mary, protects water quality and quantity.
- 5 Motor vehicle use occurs at sustainable levels on the Coconino NF to provide opportunities for a variety of motorized use types and levels of challenge for a diversity of users. Travel restrictions are clearly understood by forest visitors.

### *Facilities*

- 6 Recreation sites, administrative buildings, dams, and other infrastructure operate as intended and provide a safe environment for people. Energy efficient and economical facilities incorporate emerging technologies and are placed where they can be used effectively while making sustainable use of natural resources.
- 7 Forest facilities that are eligible for the National Register of Historic Places continue to be available for administrative use, recreation, interpretation, tribal events, and other uses, unless prevented by concerns for health and safety. These sites retain their importance in



American history through historic preservation and adaptive reuse and continue to contribute to the historical significance of the community.

### **Objectives for Roads and Facilities**

FW-RdsFac-O

- 1 [Decommission](#) 200 to 800 miles of a combination of unauthorized roads and system roads not identified on the motor vehicle use map during the 10 years following plan approval. The motor vehicle use map is developed through a separate process established under the [Travel Management Rule](#). [Road decommissioning](#) may be done in coordination with other management activities, such as the Four Forest Restoration Initiative.

### **Standards for Roads and Facilities**

FW-RdsFac-S

- 1 Motorized vehicle use shall occur as identified on a designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety.

### **Guidelines for Roads and Facilities**

FW-RdsFac-G

- 1 Roads should be located, designed, and maintained to move toward or maintain desired conditions for other uses and resources.
- 2 Roads should have adequate drainage to avoid accelerated soil erosion, loss of vegetation, and long-term impacts to soil productivity.
- 3 Roads should be signed to facilitate navigation of designated motorized routes and to prevent motorized use outside of designated areas and routes. Boundaries and routes should be clearly and uniformly identified through appropriate tools and management techniques.
- 4 Road maintenance and improvements should be consistent with ROS objectives to maintain recreation opportunities and settings.
- 5 Soil and water BMPs should be implemented to protect water quality while designing, constructing, reconstructing, or relocating new and existing roads, parking areas and pullouts. For example, permanent and temporary road construction and relocation should:
  - Occur outside of streamcourses and aquatic management zones, except where crossing is required.
  - Avoid wetlands, springs, seasonally wet meadows, and montane meadows.
  - Avoid soils that are unstable and highly erodible where connected to streamcourses.
- 6 Unneeded roads should be decommissioned to maintain an efficient and sustainable road system that maintains or moves toward other resource desired conditions.
- 7 Existing roads should be used or realigned before new roads are constructed to avoid areas where disturbance-sensitive threatened and endangered species are present.

- 8 For projects where long-term access is not needed, temporary roads should be used and [naturalized](#) in a timely manner. The intention is to have the road footprint, and potential impacts from road use, such as possible introduction of invasive species, modification of scenic integrity objectives, or increased sedimentation into connected waters, on the landscape for as short a time as possible.
- 9 Bridges, culverts, stream crossings on permanent roads, and diversion structures should be designed to allow safe passage for aquatic organisms. Passage barriers are acceptable when needed to physically separate native and non-native species.
- 10 Facilities on National Forest System lands should be designed to incorporate principles of sustainability and to reflect their place within the natural and cultural landscape. To manage unique design issues associated with specific areas or unusual circumstances, specific built environment image guides should be developed.

### **Management Approaches for Roads and Facilities**

#### ***Roads***

Work closely with the State, counties, and other Federal agencies to resolve right-of-way issues and to ensure that public access to the various parts of the Coconino NF on State, county, or permanent National Forest System roads meets management objectives for all ownerships.

Work closely with utilities to ensure access to rights-of-way and infrastructure.

Cooperate with the National Park Service to identify Forest Service roads near boundaries with national monuments that should be closed or decommissioned from the system to prevent trespass onto National Park Service land.

Consider wildlife and plant habitat needs early in the transportation and development planning process.

Work closely with the Arizona Game and Fish Department, Arizona Wildlife Linkages Working Group, Arizona Department of Transportation, and others to identify linkages and potential barriers to wildlife movement and to mitigate such threats during project design.

Take advantage of opportunities to work with the Federal Highway Administration, Arizona Department of Transportation, and other road management agencies to improve safe wildlife movement across interstate highways.

Encourage private landowners who use forest roads to take maintenance responsibility for roads that serve primarily private uses.

Cooperate with local and regional governments, Federal Highway Administration and Arizona Department of Transportation on the planning, design, construction, and maintenance of highway corridors.

The application of timing restrictions, like those referenced in FW-WFP-S-1 and FW-WFP-G-8, will be based on site-specific information and may vary depending on variables such as species; weather; timing of activity relative to species life cycle; or duration, frequency, and type of activities that are occurring in the species' habitat. Other variables to be considered could include the duration, extent, and intensity of the proposed activity, or the type of activity itself, such as

emergency or safety-related actions versus non-emergency activities. The best available information and science is utilized to develop timing restrictions to reduce impacts to disturbance-sensitive species.

Factors in prioritizing the naturalization of decommissioned and unauthorized roads include the following:

- Watershed Condition
  - Soils that are receiving, or are expected to receive, damage to the extent that soil productivity is or will be significantly impaired outside of the road prism.
  - Riparian areas (springs, wetlands, or stream reaches) that are impaired or non-attaining due to sedimentation or alterations to [hydrology](#) related to the road.
  - Meadows at the TEUI montane meadows polygon map unit scale that are likely to be or are being damaged.
  - Poorly located, designed, or maintained roads connected to downstream impaired or non-attaining waters, where potential for increased runoff and sedimentation is high.
- Wildlife, Fish, and Plants
  - Habitats for threatened, endangered, or sensitive species that are susceptible to roads as barriers or roads as mortality hazards.
- Social and Cultural Values
  - Areas of high or very high scenic integrity.
  - Roads that provide undesirable access to archaeological sites and areas of traditional cultural use by consulting tribes.
  - Areas where user conflict must be resolved or to ensure public safety.
  - Areas with Semiprimitive non-motorized [ROS](#) objectives.
  - Roads where use levels or road maintenance causes adverse noise effects to recreational experiences.
  - Redundant roads.
  - Roads that are not identified on the [motor vehicle use map](#), which are not needed for administrative purposes.
  - Roads that continue to be used for public access despite motorized restrictions.

### *Facilities*

Develop design narratives that provide criteria to determine the appropriate location, capacity, and type of facility required to meet user needs in the context of the forest setting.

Consult with archaeology staff on adaptive reuse and historic significance of structures that are older than 50 years. Reference the current facility master plan required by FSH 7300 to address reuse and historical significance of structures. Consult the master plan for historical status, condition, and recommendation categories.

Evaluate outdated facilities and sites for current and future needs, potential reuse, and the ability to update or retrofit in order to meet the agency's mission in an economical manner.

Protect native plants to the extent possible by site design and mitigation measures during construction.

## **Land Adjustments**

See appendix A, map 11.

### **General Description for Land Adjustments**

[Land adjustment](#)s are the real estate transactions on the forest including sale, purchase, exchange, conveyance, and rights-of-way. [Land exchange](#) and [land purchase](#) have been, and will continue to be, the means by which the Coconino NF acquires key wildland resources and open space areas. Land exchanges are discretionary, by regulation.

### **Desired Conditions for Land Adjustments**

FW-LndAdj-DC

- 1** The Coconino NF has a mostly contiguous land base that provides for biologically diverse public lands with minimal impacts from adjacent land uses. Most of the forest has a natural-appearing landscape that has not lost its wildland character. Open space values are retained, including those related to naturally appearing landscapes, wildlife habitat, riparian/wetland character, and recreational opportunities.
- 2** Easement rights-of-way across lands of other ownership provide access to the forest.

### **Guidelines for Land Adjustments**

FW-LndAdj-G

- 1** To better promote the mission of the agency, lands that the forest considers for acquisition should have one or more of the following qualities:
  - Contains habitat for threatened or endangered species and sensitive species.
  - Contributes to the continuity of wildlife and plant habitat.
  - Contains or influences wetlands, riparian areas, or other water-related features
  - Provides needed access, protects public lands from fire or encroachment, or prevents damage to resources.
  - Contributes to areas of high or very high scenic integrity.
  - Improves the ability to manage a designated special area.
  - Contains significant sites with cultural, scientific, or recreational values.
- 2** To retain the Forest's setting and contribution, lands that leave Forest ownership as part of a land adjustment should have one or more of the following qualities:
  - Isolated from other National Forest System lands.
  - Does not contain unique cultural, scientific, or ecological resources.
  - Managed for a single commercial or other special use, for which it is being exchanged or sold.
  - Has lost its wildland characteristics.

- Meets the needs for communities and the public such as for a water treatment plant.
  - Resolve innocent encroachments as opportunities arise.
  - Improve National Forest System management such as administrative sites, recreation residence tracts, and organizational camps.
  - Adjacent to existing lands of other ownership.
- 3 When responding to requests for new access permits or easements, easements should be granted in reciprocity to ensure administrative and public access to the forest unless they are inappropriate because of the physical situation of the site or because they would conflict with the desired conditions of the area.

### **Management Approaches for Land Adjustments**

Consult with local governments about land adjustment proposals the forest plans to take forward into the NEPA process. Public input on land adjustment begins at the time a site-specific land exchange is formally proposed and has met other land adjustment criteria and plan direction.

If acquisition cannot occur, collaborate with private landowners and county governments in the land development process to protect unique resources such as scenery, adjacent wilderness, archaeological values, and threatened and endangered species habitat. Encourage local governments or agencies, private landowners, and/or other appropriate entities (such as The Nature Conservancy, Trust for Public Land, Archaeological Conservancy, and local land trusts) to protect the resources and character of the national forest through methods such as conservation easements, land trust management, deed restrictions, or public acquisition of adjacent, high-priority parcels.

Cooperate with local governments to identify and maintain appropriate trail access on private lands through the private land development process.

Work with landowners and local and regional governments to encourage policies and development practices that conserve open space, preserve adjacent recreation opportunities, reduce wildfire risk, and retain ecosystem benefits. Provide input to the design requirement of new developments (especially when they are adjacent to the forest) and participate in community growth planning efforts. Participate as a government liaison concerning open space issues. Continue linking city and county trails to National Forest System trails. Share public outreach and education tools and information about future plans.

Support open space designations adjacent to the forest to minimize conflicts between residents and other forest users. Review and participate in local government plans to encourage open space objectives that are consistent with national forest management direction and policies.

Work with local and regional governments and road agencies to develop transportation solutions that reduce traffic and vehicle impacts on National Forest System lands.

Work with homeowner associations and homeowners to plan and implement measures that reduce wildfire threats to life and property such as: providing reasonable road ingress and egress for emergency evacuation of personnel, and providing reasonable road access suitable for use by fire engines, including places to turn engines around.

## Special Uses

### General Description for Special Uses

[Special use](#) permits authorize a variety of activities on the Coconino NF and can be divided into two broad categories: lands and recreation.

#### *Land Special Uses*

Land special uses include authorizations associated with utility lines, road use, communication sites, research, water resources, wind energy development and related access. Utility and energy transmission corridors, along with communication sites, are generally long-term commitments of National Forest System lands. Increased demand is expected for utility lines; renewable energy sources; community infrastructure; private land access; and local, State, and Federal public transportation systems to serve the growing populations of Arizona and the Southwest.

#### *Recreation Special Uses*

Recreation special use permits authorize services that support the Forest Service mission and meet the needs of the public. These permits are a partnership between the Forest Service and private businesses and individuals to provide services and facilities such as outfitter-guide services, skiing, and special events.

### Desired Conditions for Special Uses

FW-SpecUse-DC

#### *All Special Uses*

- 1 Authorized activities are consistent with desired Recreation Opportunity Spectrum settings. Motor vehicle use for authorized activities occurs on roads and trails displayed on the motor vehicle use map or on roads specifically authorized.

#### *Land Special Uses*

- 2 Infrastructure on National Forest System lands (utilities, water lines, roads, and bridges) and vegetative clearing for utility and energy transmission corridors meets the legal mandates to facilitate the transmission and development of energy resources in a safe and reliable manner that maintains or move towards other desired conditions applicable to the area. Rights-of-way and authorization for road construction occur at locations and with plans and specifications that effectively protect national forest and other affected owners' lands and resources.
- 3 Utility lines, such as pipelines, power lines, fiber optic lines, and telephone lines, are not visible (usually buried) across the landscape unless there are overriding environmental, economic, or technical concerns.
- 4 Information about the screening process for special use permits is available and understandable to the public.
- 5 The forest supports renewable energy production and facilitates its development consistent with land capability, desired conditions for other resources, and public values.

- 6 Research permitted on the national forest is focused on improving the scientific understanding of natural and social systems. Research projects conducted under special use permits:
  - Help realize and understand the scientific potential of the abundant cultural and natural resources found on the Coconino NF.
  - Are clearly related to the mission of the Forest Service.
  - Provide needed data or other resources for future forest management.
  - Expand the knowledge of rare species on the forest.

#### *Recreation Special Uses*

- 7 Special use activities blend into the landscape, are compatible with resource protection, and do not draw attention to the activity or equipment. Commercial tours are focused on main [roadways](#) and vistas as well as selected recreation locations.
- 8 Commercial and recreational activities are consistent with site-specific direction for other forest resources and community goals.
- 9 Sites for large group gatherings and recreation events provide a range of opportunities from more primitive and undeveloped settings with no amenities for visitor comfort, to more developed settings that provide amenities. These previously analyzed and approved sites are generally areas that are compatible with use by the general public. Maximum group-size capacities and approved activities are identified for each site. Resource impacts at these sites are confined and localized.
- 10 The footprints for recreation residences and commercial facilities are stable with some exceptions to accommodate improvements that address health, safety, and environmental issues.
- 11 Organization camps managed under special use permits are focused on natural resource values, conservation education, and emphasize non-motorized recreation opportunities.

#### **Objectives for Special Uses**

FW-SpecUse-O

#### *Recreation Special Uses*

- 1 Approve at least four sites for recreation events and large group gatherings within 10 years of plan approval. Sites will be analyzed for resource concerns and have all required clearances.

#### **Standards for Special Uses**

FW-SpecUse-S

#### *Recreation Special Uses*

- 1 Prohibit motorized aircraft landings and takeoffs associated with outfitter-guide activities on National Forest System lands and waters, except for emergencies and rare administrative support activities.

- 2 Require permit holders to rehabilitate unplanned, user-created trails and other impacted areas created by their activities that were not authorized under their special use permit.

### **Guidelines for Special Uses**

#### FW-SpecUse-G

##### *All Special Uses*

- 1 Lands and recreation special uses should be designed to maintain or move toward desired conditions for other uses and resources.
- 2 To reduce social conflicts, all special use activities should occur during times, in ways, and in locations that are consistent with the needs of national forest users while addressing disturbance and safety concerns for area residents.
- 3 Lands and recreation special use permits should not be issued for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources such as federally listed or Southwestern Region sensitive species. The intent is to protect riparian resources. Exceptions may be made for hardened or slickrock sites, water-dependent activities, or safety.

##### *Land Special Uses*

- 4 To optimize use of existing sites, and to limit impacts to resources, existing communications sites should be expanded as allowed by existing or updated communication site plans before creating new sites. The number of towers should be managed by approving designs capable of co-locating multiple communication carriers/services.
- 5 New and reconstructed overhead utility lines, support towers, and other utility infrastructure should be located and designed to minimize adverse ecological, wildlife, and scenic impacts.
- 6 Vegetation that does not interfere with meeting vegetation clearance requirements in rights-of-ways should be retained to allow screening for scenery, habitat for species, and corridors for wildlife movement.
- 7 Structures, such as communication sites and utilities, should be designed to reduce contrast with the [desired landscape character](#) in accordance with scenic integrity objectives.
- 8 To optimize use of existing utility sites and corridors and to limit impacts to undisturbed areas, sites and corridors for existing utilities and areas adjacent to road rights-of-way should be used or expanded before creating new sites or corridors.
- 9 Utility lines should be buried to maintain scenic values. Where environmental, cultural, economic, or technical concerns prevent the burial of utility lines, site-specific design features should be developed to protect scenic values.
- 10 To support the purposes of research natural areas, geological areas, botanical areas, and environmental study areas, new [utility corridors](#) should avoid these areas.
- 11 Alternative energy developments, such as wind energy, should be designed to minimize or avoid impacts to other uses and resources, in particular wildlife and scenic integrity.
- 12 Access roads to a parcel of private property should be managed to reduce and control proliferation of roads on the forest while meeting legal obligations to owners of inholdings.



- 13 Aircraft activities related to commercial filming should be restricted to protect threatened, endangered, and sensitive species from noise disturbance.
- 14 To prevent publicizing the location of cultural sites, commercial filming and photography at cultural sites should be prohibited.
- 15 Research projects should be co-located with other research activities, when possible, to optimize the use of existing research sites and reduce conflicts with other uses, or resources.

#### *Recreation Special Uses*

- 16 To improve resource management and promote recreation opportunities, outfitter-guide permits should only be issued for activities that have demonstrated public need, promote transportation services, or improve public safety. Any new permit should maintain or increase protection of cultural or natural resources.
- 17 In order to maintain recreation settings, the total of outfitter-guide and unguided users should not exceed encounter levels as described in the designated ROS class.
- 18 To prevent compaction of soils and overutilization of popular areas, outfitter-guide activities, such as motor vehicle use and camping, should be excluded from areas with sensitive resource issues, such as a high density of archaeological sites, sensitive wildlife areas (including riparian areas or areas with sensitive or rare plants), and adjacent to urban areas.
- 19 To minimize impacts and to protect sensitive resources, large group gatherings and recreation events should occur in suitably developed sites or other areas that have already been analyzed and approved for these uses. In addition, applicants are encouraged to use lands of other ownership for staging when possible.
- 20 Commercial tours at high interest archaeological sites—such as Honanki—should be consistent with site protection, visitor experience objectives, and tribal interests.
- 21 For permitted special use activities that include stock animals, on sites where forage and/or water are limited, the permittee should haul feed and/or water to prevent over grazing of the site and to prevent the depletion of onsite water resources.

### **Management Approaches for Special Uses**

#### *All Special Uses*

When special use proposals request use on multiple units, the lead or receiving unit coordinates with other units affected by the proposal.

#### *Land Special Uses*

Encourage proponents to involve the forest early in the special use permit proposal development process.

Consider processing right-of-way grants by priority; first priority being the public interest and national forest needs.

Collaborate with the Rocky Mountain Research Station in assessing research needs, opportunities, and methods relevant to current and future forest management.

Coordinate with the research community to identify and manage long-term research locations with the intent of balancing research and management needs.

When utility facilities traverse National Forest System lands administered by more than one ranger district within the Coconino NF, coordinate with utility companies in the development of regular operating plans to document agreements and activities along these corridors for consistent and seamless decisions where appropriate, that can be integrated along whole linear rights-of-way or utility corridors.

### ***Recreation Special Uses***

Priority is given to permit applications received in response to a prospectus issued by the Forest Service. Unsolicited proposals will be evaluated on a case-by-case basis as workload allows.

Prior to considering outfitter-guide and recreation event permits, complete a determination of need and capacity in areas with heavy recreation use by the general public prior to considering outfitter-guide and recreation event permits.

Develop a forestwide or districtwide management plan for administering special use permits.

Work cooperatively with the National Park Service for special use requests that occur on both Forest Service and National Park Service lands. Before permitting outfitter-guides in areas adjacent to national monuments, contact the National Park Service for coordination.

Coordinate wildlife-dependent special use permits with the Arizona Game and Fish Department.

## **Recreation**

### **All Recreation**

#### **General Description and Background for All Recreation**

Coconino NF provides public access to central Arizona settings that accommodate a wide range of opportunities for outdoor, nature and culture based recreation. Interstates 40 and 17 connect the Coconino NF with several urban populations including Phoenix, Tucson, Flagstaff, Las Vegas, and Albuquerque. Smaller rural towns and communities utilize parts of the Coconino NF as local recreation areas and tourism attractions. As populations increase and recreation technologies advance, demand continuously grows for recreational opportunities.

Elevation on the Coconino NF ranges from 2,600 to 12,633 feet, the highest point in the state, supporting a diversity of settings and challenges for recreation. The forest provides year-round recreation with seasonal opportunities to escape the heat in the higher elevations or seek out warmth in the lower elevations. Mountains, canyons, cinder cones, caves, and cliffs provide varying challenges and recreation experiences while rivers, creeks, and lakes offer scenic settings for water-based activities. Numerous heritage sites offer educational and scientific opportunities for cultural understanding and awareness. Campgrounds, rental cabins, and picnic sites provide developed recreation settings and conveniences.

These settings offer a full spectrum of developed and dispersed recreational opportunities forestwide. Visitors can participate in camping, hunting, nature study, and wildlife viewing. Visitors can also hike, bike, horseback ride, and backpack on hundreds of miles of trails with varying degrees of challenge. Water-based activities include, but are not limited to, fishing,

swimming, and boating. Some rivers have sections that offer more challenging opportunities for recreation such as whitewater for kayaking, canoeing, and rafting. In more dispersed settings visitors can engage in more challenging opportunities such as rockclimbing, canyoneering, spelunking, and emerging recreational pursuits. Several rock climbing areas on the Forest are nationally and internationally known.

### Desired Conditions for All Recreation

#### FW-Rec-All-DC

- 1 Recreation on the Coconino NF enhances the quality of life for residents and provides tourist destinations, which contribute to local economies.
- 2 The diverse landscapes of the Coconino NF offer a variety of settings for a broad range of recreational opportunities in all seasons and access to natural, wild places.
- 3 Recreation programs, infrastructure, and services are useable by all people to the greatest extent possible without separate or segregated access for people with disabilities.
- 4 Coconino NF provides a broad spectrum of developed and dispersed recreation settings (see appendix A, map 12). Some recreation settings are undeveloped and offer opportunities for primitive character, challenging access, and solitude while other settings offer opportunities for more developed infrastructure, easier access, higher levels of social interaction, and increased user comforts. Social encounters in an area, road or trail are generally consistent with ROS settings. In general, social encounters would be similar to the levels shown in table 7.

**Table 7. ROS setting, human contact, and social encounters**

ROS Setting	Evidence of Human Contact and Human Use	Social Encounters
Rural and Roaded Natural	Highest contact with other visitors and highest evidence of use compared to other ROS settings	Social encounters are higher within ½ mile of trailheads, paved roads, and residential areas.
Semiprimitive Motorized and Semiprimitive Non-motorized	Lower contact with other visitors and lower evidence of human use than in Rural and Roaded Natural but higher levels than Primitive or Wilderness ROS settings.	Social encounters are higher within ½ mile of trailheads and at destination features such as water, natural formations, cultural features, vistas.
Primitive	Lower contact with other visitors and lower evidence of human use than in Semiprimitive Motorized and Semiprimitive Non-motorized but higher levels than Wilderness ROS settings.	Social encounters are higher within ½ mile of trailheads and at destination features such as water, natural formations, cultural features, vistas.
Wilderness	Lowest contact with other visitors and lowest evidence of use compared to other ROS settings.	Social encounters are higher within ½ mile of trailheads.

- 5 Low impact recreation principles are widely practiced by the visiting public. Recreation settings and forest resources are free from human litter, graffiti, and vandalism.
- 6 Recreation opportunities are balanced with the capacity of forest resources to support them. There are minimal user and resource conflicts. As development and population in the region continue to grow and new forms of recreation emerge, recreation settings on the Coconino

NF are stable, retaining their natural character. Short-term increases in recreation during holidays and weekends do not result in long-term adverse effects to other forest resources.

- 7 Developed recreation sites located adjacent to road corridors emphasize safety and minimize user conflict.
- 8 Wildlife-based recreation takes place in a variety of settings, from highly developed to primitive.
- 9 Water-based recreation opportunities at waterways and lakes emphasize day-use, nature-based activities.
- 10 Opportunities for experiencing solitude and natural soundscapes are consistent with ROS objectives.

### **Guidelines for All Recreation**

#### **FW-Rec-All-G**

- 1 Recreational activities, locations, and/or settings should be designed and managed to maintain or move toward desired conditions for other uses and resources.
- 2 Recreational activities, locations, and/or settings should be managed to have minimal user conflicts, to be in balance with the capacity of other resources to support them, to promote public health and safety, and/or to prevent wildlife access to food, trash, and human waste.
- 3 To accommodate varying visitor access needs, programs, infrastructure, and services should incorporate principles of universal design and reflect current [accessibility](#) guidelines.
- 4 Parking should be restricted or designated parking spots should be provided to prevent resource damage and to promote public safety while ensuring visitor access within the capacity of the site.
- 5 To improve access and safety for forest visitors while protecting other resources, parking areas should be designed, based on the recreational opportunities provided at the site, for a variety of vehicles, including larger vehicles and trailers.
- 6 Forest visitors with recreational stock should carry hay, cubed, pelleted, or rolled feed that is certified weed-free to prevent the spread of invasive plants.
- 7 Recreation site and use fees should be affordable to ensure access for a broad spectrum of forest visitors.
- 8 Signs should be provided so people can easily find trails and facilities.

### **Management Approaches for All Recreation**

Collaborate with State and Federal agencies including National Park Service, Arizona State Parks, Arizona Game and Fish Department; concessionaires; chambers of commerce; nonprofit organizations; Northern Arizona University; State, city and county governments; recreation stakeholders; local communities and citizens; partners; and volunteers regarding provision of recreation opportunities in northern Arizona and communicating these to the public. Work in partnership to find creative solutions to operate and maintain recreation sites, trails and trailheads, and provide interpretive and environmental education. Determine gaps and overlaps in opportunities and resolve conflicts between users, and providers. Work together to determine

activities that increase our capacity to serve a diverse population while promoting social, economic, and natural resource sustainability.

Coordinate with local governments to provide for snow removal and safe conditions for travel to and from winter outdoor activities.

Coordinate with the Arizona Game and Fish Department and other stakeholders to provide a network of wildlife viewing opportunities.

Coordinate with the Arizona Game and Fish Department to provide fishing access to meet goals and objectives of the Department's fisheries plans.

Collaborate with local agencies, communities, groups, organizations, and other stakeholders on transportation solutions that reduce traffic and resource impacts at high use recreation areas.

Collaborate with the Arizona Game and Fish Department, local law enforcement, and other stakeholders to address issues and opportunities related to recreational shooting on the Coconino NF.

Adopt design standards and best management practices as they become available for recreation activities to provide safe recreation opportunities and to minimize resource impacts.

## **Developed Recreation**

(See appendix A, maps 2, 3, and 14.)

### **General Description and Background for Developed Recreation**

Developed facilities are sites where the Forest Service provides multiple amenities for the purpose of visitor comfort and convenience. Developed sites on the forest include campgrounds, picnic areas, interpretive sites, and other day-use sites. These areas are typically hardened to accommodate higher levels of use.

### **Desired Conditions for Developed Recreation**

FW-Rec-Dev-DC

- 1 Developed recreation opportunities are available for individuals, families and groups, with a multitude of recreation experience types. Campgrounds, rental cabins, and reservoirs provide developed recreation opportunities.
- 2 Developed recreation facilities such as campgrounds, cabins, and picnic areas are clean, energy efficient, and maintained to standard. Developed sites blend with the natural setting, and uses at these areas do not cause damage to ecologically or culturally sensitive areas.
- 3 Where there are high levels of visitor use, most visitor activities occur at developed sites and on trails designed for high levels of use. High levels of developed recreation use are accommodated by facilities and/or services, such as potable water, sanitation, refuse, and recycling, that balance resource protection with recreation demand.
- 4 Developed sites promote visitor safety and enjoyment of the area.

- 5 Developed camping facilities provide a level of amenities appropriate for their desired recreation opportunity spectrum (ROS) setting (see appendix A, map 12). Most campgrounds are part of a centralized strategy that consolidates developed recreation opportunities and protects resources.
- 6 Well planned and maintained trails are available to link users in developed sites to a variety of nearby recreation opportunities.
- 7 Developed [group sites](#) are provided across the forest; are strategically located to protect resources; and reduce the need for large group gatherings in dispersed recreation areas. Developed group sites have varying capacities and provide for adequate sanitation and amenities. Some developed group sites offer users a place to gather near towns and communities, and may be co-located with developed campgrounds or day-use facilities.
- 8 Developed sites adjacent to water protect water quality, and prevent vegetation damage, soil erosion, and compaction from water-based recreation activities.
- 9 In and around developed sites, invasive weeds and invasive aquatic organisms are not established or transported.

### **Guidelines for Developed Recreation**

#### **FW-Rec-Dev-G**

- 1 Developed recreation sites should be managed to protect human health and safety, and should be located to avoid floodplains, rock fall areas, and other areas of hazardous concern.
- 2 To promote a natural-appearing landscape, use of native plant species should be emphasized during planning activities (such as design of new sites or improvements to existing sites). Invasive species should be removed or treated on existing sites before they become widespread within recreational sites.
- 3 Developed recreation sites should be managed to discourage or prohibit broken or cut tree limbs or the removal of all downed woody debris to maintain a natural-appearing landscape, to maintain the integrity of the site, and to control accelerated erosion.
- 4 Developed snowplay areas should be planned, designed, and managed to promote human health and safety.

### **Management Approaches for Developed Recreation**

Patrol areas regularly to inspect for public safety, facility/resource protection, and fee compliance.

Adaptively shift limited resources to manage recreation facilities and opportunities as needed.

Determine the operation or closure of a site based on the volume of use and operating costs.

Develop a sustainable mix of Federal funds, area use fees, other funds, and partners to maintain or replace facilities and infrastructure as needed.

Develop design narratives to provide criteria regarding the appropriate location, capacity, and type of facility required to meet user needs in the context of the forest setting. As the public's needs change, use a facilities master planning process to identify the need for adjustments to developed sites and facilities.

Fee areas and concessionaires may be used to maintain and manage developed facilities, particularly in high-use areas. Ensure that Forest Service rules are enforced consistently through permit administration.

Work with concessionaires to manage developed snowplay areas for the protection of human health and public safety.

Where appropriate, consider historic cabins and guard stations for recreation rental opportunities.

## **Dispersed Recreation**

See appendix A, maps 2, 3, 14, and 17.

### **General Description and Background for Dispersed Recreation**

Dispersed recreation consists of activities that take place in less improved settings, outside of or disconnected from developed or concessionaire-operated facilities. Many dispersed recreational pursuits occur on the Coconino NF. Dispersed recreation activities are numerous and diverse with new activities constantly emerging and growing in popularity. Currently, some of the more common dispersed recreation on the Coconino NF include: hiking, camping, hunting, fishing, horseback riding, mountain biking, rock climbing, geocaching, and motorized vehicle recreation.

The forest plan identifies several areas managed for [non-motorized](#) recreational experiences and quiet. These are addressed under the management areas in which they occur: Pine Belt, San Francisco Peaks, Lake Mary Watersheds, and Verde Valley.

### **Desired Conditions for Dispersed Recreation**

FW-Rec-Disp-DC

- 1 The diverse landscapes of the Coconino NF offer a variety of settings and challenges for a broad range of recreational opportunities in all seasons. There are numerous locations for visitors to escape into natural, wild places. Semiprimitive and primitive settings retain their remote and undeveloped characteristics.
- 2 Motor vehicle use occurs at sustainable levels on the Coconino NF to provide opportunities for a variety of motorized use types and levels of challenge for a diversity of users. Motorized vehicle use occurs as identified on the motor vehicle use map, except as authorized by permit or for administrative uses.
- 3 Areas used for dispersed recreation across the forest retain their natural character to the extent possible and have minimal evidence of human waste and litter, sanitation issues, and resource damage.
- 4 A range of choices are available for both motorized and non-motorized [dispersed camping](#).
- 5 The Coconino NF provides abundant and high-quality opportunities for hunting, fishing and other wildlife-based recreation opportunities.
- 6 Seasonal Closure Areas provide opportunities for non-motorized recreational experiences and provide habitat with reduced disturbance from motorized activities.

### **Standards for Dispersed Recreation**

#### **FW-Rec-Disp-S**

- 1 Motorized vehicle use shall occur as identified on a [designated system of roads, trails, and areas](#) (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety.

### **Guidelines for Dispersed Recreation**

#### **FW-Rec-Disp-G**

- 1 To prevent motorized use outside of designated areas and routes, boundaries and routes should be clearly and uniformly identified.
- 2 In designated dispersed camping sites and corridors, vegetation should be retained to provide shade and screening around hardened sites to preserve the recreation setting.
- 3 Visitors should be restricted from soil and plant restoration sites to promote re-establishment of vegetation and functioning soil.
- 4 Dispersed winter recreation and snowplay activities should be located and managed to promote public safety and to prevent or reduce conflicts between motorized and non-motorized users.
- 5 Dispersed camping along riparian areas should be managed to maintain or move toward desired conditions for riparian areas and water.

### **Management Approaches for Dispersed Recreation**

Establish long-term partnerships with recreation organizations to help plan, construct, and maintain motorized and non-motorized recreation opportunities and foster a low-impact conservation ethic.

Develop management plans and/or strategies through collaborative efforts for specific dispersed recreation activities and/or locations to addresses user needs, visitor safety, and resource protection. Activities or locations could include motorized recreation for Cinder Hills OHV Area, rock climbing at the Oak Creek Vista, and mountain biking around Sedona.

Update the [memorandum of understanding](#) between the National Park Service and Coconino NF.

Coordinate with city, county, and State law enforcement agencies to assist with the enforcement of Federal laws at known Coconino NF dispersed recreation areas on holiday weekends.

Coordinate with city, county, State, and other agencies to manage motorized recreation and reduce cross-boundary conflicts.

### **Trails and Trailheads**

#### **General Description and Background for Trails and Trailheads**

Trails provide visitors to the Coconino NF with a variety of non-motorized and motorized access options. Each trail is assigned a use or combination of uses (such as hiking, biking, equestrian,



and motorized). The majority of trails on the forest are open to all modes of non-motorized recreation. Trails open for motorized travel are identified through the travel management process and are included on the motor vehicle use map. Trailheads are the gateways to Coconino NF, providing visitors with portals to the trail system. Trailheads can range from simple pullouts and trail signs to more developed parking areas with additional amenities for increased user comfort and enjoyment of the assigned uses of the associated trail system.

### **Desired Conditions for Trails and Trailheads**

#### **FW-Rec-Trails-DC**

- 1** A system of well-marked and well-maintained sustainable trails provides opportunities for visitors to explore the Coconino NF and surrounding areas. Trails are planned and designed to be harmonious with neighboring lands and trail systems through logical connections, which expand recreational opportunities.
- 2** There are a variety of trail types and levels of challenge for a diversity of users within a variety of settings. Trails offer a range of terrain and conditions.
- 3** The level of development at trails and trailheads is appropriate to the site, types of use, and ROS setting.<sup>10</sup> Infrastructure at trailheads and along trails is durable, sustainable, and appropriate for the setting.
- 4** Damage to resources from visitor use of trailheads and trails is minimal and within the ability of the forest to mitigate or restore.
- 5** Multi-use trails are more common than single-use trails. In some areas, trails provide loop connections by following existing roads.
- 6** Motorized routes are easily identified on the ground and on the motor vehicle use map.
- 7** Roads and trails provide various challenge levels for motorized recreation opportunities and are available for off-highway-vehicle touring.
- 8** Motorized recreation routes provide long distance connections between motorized recreation hubs.
- 9** Single-track motorized vehicle trails emphasize solitude from wider types of motorized vehicles.
- 10** Trailheads are easily accessible and are compatible with the traffic flow along main roads. Access roads to trailheads are open and maintained, and trailheads provide parking and vehicle turnaround space.
- 11** Trail use remains on the established trail surface, especially in high traffic or sensitive areas. Unplanned user-created trails are rare.

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<sup>10</sup> For example, an area that is providing access into a semiprimitive non-motorized or primitive setting uses natural materials and has minimal signing. Trails and trailheads in more developed settings may have constructed fencing, gravel or pavement, increased number of signs, and other developed features more consistent with the site's ROS objective.

### **Objectives for Trails and Trailheads**

#### **FW-Rec-Trails-O**

- 1 Develop or modify 2 to 8 systems of sustainable designated bike trails, equestrian trails, and/or motorized trails to adequately provide for these user groups and reduce conflicts between user groups within 10 years of plan approval.

### **Guidelines for Trails and Trailheads**

#### **FW-Rec-Trails-G**

- 1 Trails and trailheads should be designed, built, rerouted, or maintained utilizing current best practices that promote sustainable trail surfaces, prevent conflicts with neighboring lands, address impacts to other resources, and consider user experiences.
- 2 To provide access to year-round recreation activities, trailheads that are needed for multi-season recreation access should be designed to accommodate snow removal.
- 3 Unplanned, user-created trails should be managed to prevent future access. Resources damaged by unplanned, user-created trails should be rehabilitated to accelerate recovery and to prevent further resource impacts.
- 4 On trails that pass through active range allotments or other fenced boundaries, user friendly gates should be installed adjacent to existing wire gates or in place of wire gates (barbed wire pass-throughs) to facilitate easier passage for recreational users and to prevent unintended movement of livestock.
- 5 Closed roads should be considered for conversion to motorized and/or non-motorized trails to promote or expand recreation opportunities when it benefits or does not degrade other resources.
- 6 Motorized trails and trail systems should be designed to move users away from residential areas and to reduce conflicts between motorized users and neighboring lands.

### **Management Approaches for Trails and Trailheads**

Work with the Arizona Trail Association, Great Western Trail Association, and other associated groups to maintain the long-distance trail opportunities on the Forest.

In general, multi-use trails are preferred, though single-use trails may be considered where trail design cannot mitigate user conflicts or provide for a sustainable recreation settings between multi-use types.

Collaborate with county and city trails coordinators, local groups, and area residents, when conducting trail planning. Consider needs for non-motorized and motorized trails, and provide opportunities for both.

Maintain and expand volunteer partnerships with local communities, organizations, groups, and agencies to assist in trail planning, construction, and stewardship.

Coordinate trails and trailhead parking with future development on adjacent lands so as to be proactive in designing trails and trailheads to maintain access to public lands and protect resources.

For trail system analyses and decisions, include consideration of current Forest Service Trail Accessibility Guidelines for all new construction or rehabilitation proposals.

## **Interpretation and Education**

### **General Description and Background for Interpretation and Education**

The ecological and social diversity associated with the Coconino NF provide opportunities for interpretation and education on a wide array of forest resources. Interpretive efforts can improve or expand the experience of visitors to the forest. Education can aid forest management by suggesting practices that help maintain or move toward desired conditions. Interpretation and education help forest managers and forest visitors build a shared vision of the resources and management of the Coconino.

### **Desired Conditions for Interpretation and Education**

FW-InterpEd-DC

- 1 Forest Service communication and interpretive messages show respect for the diverse backgrounds and needs of visitors. Visitors are well informed and interpretation emphasizes a land ethic that explains how to reduce their impacts on ecosystems and support the Coconino NF's efforts to protect natural resources and wilderness values. "Leave no Trace," "Tread Lightly," fire prevention, wildlife awareness (such as lead reduction, Be Bear Aware, Animal Inn, etc.) and archaeological resource protection principles are promoted and practiced by the visiting public.
- 2 Through a variety of strategically located interpretive facilities and/or efforts, forest visitors learn about, become oriented to, and appreciate forest and cultural resources, history, and management, such as wilderness, geology, botanical communities, biodiversity, and heritage site etiquette.
- 3 Coconino NF information boards provide recreation maps and visitor information that may include site-specific interpretation, trip preparedness, ethics, seasonal information, and restrictions or closures. Information kiosks concentrate messages, eliminating the need for multiple signs.
- 4 Interpretation and education on the Coconino NF adapts over time and responds to changes in population to inform forest visitors on local and regional resource topics, best available science, sustainable practices, and environmental ethics.
- 5 Visitors are provided properly placed, clearly worded signs and information on authorized motorized use and restrictions. Information kiosks are located at main entryways to the Coconino NF and display pertinent motorized recreation information such as maps and signs that provide road and trail information. Kiosks explain national forest regulations for such activities as OHV travel, dispersed motorized camping, and trail opportunities.
- 6 Roving and guided interpretive activities are available in areas of high visitor use.
- 7 Interpretation and volunteer efforts foster a sense of stewardship for forest resources in residents adjacent to National Forest System lands.

- 8 The prehistoric and historic backgrounds of the Coconino NF are an integrated part of interpretive programs and highlight the relationships between landscapes, natural resources, and cultures.

### **Guidelines for Interpretation and Education**

#### **FW-InterpEd-G**

- 1 A sense of place should be incorporated into interpretive efforts to encourage forest visitors to practice low impact uses and informed stewardship of national forest lands and resources.
- 2 Information on the conditions and opportunities that may be encountered along trails should be posted at trailheads to promote visitor safety and enjoyment.
- 3 Trailhead interpretive information should identify the types of designated trail uses (such as motorized, mechanized, equestrian, etc.) to reduce user conflicts, and impacts to trails and associated resources.
- 4 To engage a larger forest visitor audience and to best serve the public, interpretive facilities and/or efforts should be provided at areas of high use and should be open on days of high visitation (for example, holidays such as Memorial Day weekend).

### **Management Approaches for Interpretation and Education**

Develop an interpretive strategy for the Coconino NF that establishes themes, provides consistent interpretive messages and mediums, and assists in establishing district priorities for implementation.

Share Leave No Trace and Tread Lightly concepts and practices in forest interpretation and visitor education.

Work with agencies, motorized recreation user groups, and other stakeholders to establish interpretive messages and programs for designated motorized routes and areas. These efforts may include improved signs, information kiosks, and other interpretive tools. Interpretive themes may include messages to foster conservation ethics, prevent lost riders, show opportunities of where to ride, identify dangerous and/or closed areas, teach riding ethics, and reduce user conflicts.

Collaborate with volunteers, other agencies, and stakeholders to promote interpretive efforts both on and off the forest.

### **Scenic Resources**

See appendix A, maps 13 and 14.

### **General Description and Background for Scenic Resources**

Scenery resources on the Coconino NF are discussed in terms of [landscape character](#), scenic integrity, and cultural features. Landscape character descriptions include natural scenic features in combination with existing land uses. They are described in terms of natural or natural-appearing features such as those associated with the geology and landform, vegetation and water, and may include land uses resulting in somewhat to heavily altered features such as utility corridors and mines. Landscape character descriptions establish the overall visual impression of the landscape

that contributes to its sense of place, provide a baseline from which to compare existing and desired conditions or to measure progress toward a desired condition, and establish a threshold from which to measure scenic integrity.

All landscapes have definable landscape character attributes. In most national forest settings, landscape character attributes are positive natural elements (such as landform, vegetative patterns, and water). Cultural elements can include land uses that alter natural features, as well as prehistoric, historic, and present day features that are, positive cultural elements. Such elements may include managed prehistoric settings where dwellings or rock art are featured and historic elements such as rustic wooden fences and corrals, local source rock walls, and rustic cabins and out buildings. In urban settings, landscape character may include architectural styles where native materials are featured. Combinations of these cultural attributes contribute to landscape character.

Even though landscape character description zone boundaries are distinct, where a landscape character applies on the ground is not always distinct and may vary over time with changes from natural disturbance and climate change. Areas around landscape character description zone boundaries may exhibit or blend with the landscape character of the adjacent zone. On-the-ground interpretation of these landscape character descriptions by a forest landscape architect or other qualified individual is acceptable, based on site-specific knowledge and documentation. Descriptions of the forest's landscape character are found in a separate document titled Landscape Character Descriptions, Coconino National Forest (USDA Forest Service 2011a).

The Coconino NF is divided into four levels of desired [scenic integrity](#): very high, high, moderate, and low. These levels set objectives for the amount of variation from the desired landscape character that is permissible within the scenic integrity level, according to Agriculture Handbook Number 701, Landscape Aesthetics: A Handbook for Scenery Management. The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the described landscape character. The overall intent is to achieve the highest possible scenic integrity. Some areas of the forest may require restoration to move toward the conditions described in the Landscape Character Description document. Buildings and structures are not always considered a negative in terms of existing scenic integrity. When they add to the sense of place or reflect the cultural legacy of an area, they contribute to scenic integrity. For instance, well-designed campgrounds can enhance recreation opportunities and enjoyment of scenery.

Scenic integrity may be used as a reference to an historic state of integrity, a description of the current state of integrity or baseline, an interim or short-term level necessary to meet a long-term goal, or a long-term scenic objective.

### **Desired Conditions for Scenic Resources**

#### **FW-Scenic-DC**

- 1 The scenic values of the Coconino NF are conserved and enhanced. Visitors see that the forest is being actively managed through visual cues such as seeing forests and grasslands with more historic conditions where there are abundant native wildflowers, grasses, and forbs; some fire effects where appropriate; and vegetation management to frame views from trails and or provide some privacy for users of developed recreation sites.
- 2 Management activities maintain or contribute to the desired scenic integrity (see map 13 for SIOs).

- 3 Long-term soil and plant productivity, and proper functioning ecosystems and watersheds are important components of landscape character.
- 4 Vegetation openings and stand boundaries are naturally shaped and are oriented to contours and existing vegetation patterns to blend with existing landscape characteristics, except where other natural resource concerns need different shapes or patterns, such as along powerline corridors.
- 5 Meadows and riparian areas are visually appealing and evidence of physical impacts is confined to specified road crossings, trail crossings, and access points.
- 6 Cultural, historic, and unique geologic features are recognized for their inherent scenic values.
- 7 [Constructed features](#), facilities, and management activities closely follow the form, line, color, texture, and pattern common to the landscape character. Where possible, these structures are visually subordinate to the surrounding landscape.
- 8 Structures and facilities that promote public enjoyment of scenic and recreation resources are part of the expected image of the public being served; however, allowable limits of contrasts do not exceed the structure's functionality.
- 9 Travel route structures are clearly distinguishable for a distance commensurate with normal speeds or intended use of such routes. Structures associated with interstates, major state highways, and regional travelways are exempted from meeting high scenic integrity objectives in the [immediate foreground](#). This exception would also include structures such as highway overpasses designed for wildlife passage or other structures to protect wildlife. This exception does not apply to segments that are designated State scenic roads or National All-American Roads. Scenic integrity objectives for the exempted areas would be determined at the project level.
- 10 Rock pits, borrow areas, and [open pit](#) mines have low to very low scenic integrity and are not seen from visually sensitive travelways and viewing points to the extent possible.<sup>11</sup>

### **Objectives for Scenic Resources**

#### **FW-Scenic-O**

- 1 Rehabilitate<sup>12</sup> at least 25,000 acres that do not meet the desired SIO by at least one level within 10 years of plan approval.

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<sup>11</sup> These locations are not mapped on the Desired Scenic Integrity Objective Map. Their scenic integrity objectives would be determined through appropriate site-specific NEPA without a plan amendment.

<sup>12</sup> In the context of scenery management, rehabilitation is a short-term management action used to return a landscape to a desired level of scenic quality formerly found in the natural landscape. While the rehabilitation action may be completed in the short term, the scenic rehabilitation may only be achievable in the long term as a result of the short-term management action.

### Standards for Scenic Resources

#### FW-Scenic-S

- 1 Management activities that are unable to maintain or move toward the desired SIO and whose effects persist in the long term shall not occur unless a decision is made to change the SIO.<sup>13</sup>

### Guidelines for Scenic Resources

#### FW-Scenic-G

- 1 Management activities and permitted uses should be designed and implemented to maintain or move toward the desired SIOs.
- 2 Evidence of fire management activities should only be apparent in the short term (as determined by site-specific information) to maintain SIOs. This guideline would not apply to areas of uncharacteristic fire, which may take longer to recover scenic integrity objectives. This guideline also would not apply to evidence of fire that is within the natural range of variability, such as an appropriate amount of burned standing trees or charred needles.
- 3 When possible, slash piles, new log landings, temporary roads, designated skid trails, dozer-created firelines, and other visual impacts from management activities should be located out of view of [Concern Level](#) 1 and 2 travel routes to avoid observation of bare mineral soil and ground-disturbing management activities. When avoiding these locations is not possible, the evidence of management activities should be restored in a timely manner following completion of the activity to harmonize with the surrounding landscape.
- 4 Stems should be flush cut, if possible, or cut less than 8 inches above ground (uphill side), where topography and operational safety allows, to maintain the scenic integrity of the immediate foreground of Concern Level 1 and 2 travel routes.

### Management Approaches for Scenic Resources

Priorities for rehabilitation of sites and facilities that do not meet SIOs consider the following:

- The relative importance of the area and the amount of deviation from the SIOs; “foreground” of high public use areas has highest priority.
- The length of time it will take natural processes to reduce the visual impacts and meet the SIO.
- The length of time it will take rehabilitation measures to meet the SIOs.

Coordinate with other entities, such as the Arizona Department of Transportation, local governments, and commercial and private entities to protect scenic integrity on and adjacent to the national forest and to identify opportunities for SIO rehabilitation.

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<sup>13</sup> A decision to change the scenic integrity objectives will be documented in a project-level NEPA decision document and in the plan Desired Scenic Integrity Objective Map. A plan amendment may be needed depending on the site-specific circumstances.

Collaborate with State and local partners on the management of scenic resources in the immediate foreground of State scenic roads and National All-American Roads.

Consider the use of forest product or vegetation management permits to make vegetation transition at the edge of linear rights-of-way less abrupt or visible, where it is necessary to clear the right-of-way boundary to meet national standards for powerline safety.

Administratively update site-specific corrections to SIOs.



## Chapter 3. Area-specific Direction

### Introduction

This chapter sets forth plan decisions and other content that apply to management areas and special areas on the Coconino NF. The management areas are generally listed in order from north to south. In addition to the plan components included in this chapter, forestwide plan components also apply to these areas. When plan components conflict, the more restrictive plan decision generally prevails. A project- or activity-level evaluation, however, may be required to resolve the conflict.

The Coconino NF is divided into contiguous management areas. Each management area is distinguished by characteristic conditions and/or human uses. Physical, ecological, cultural, and social conditions and/or management scenarios may be unique or typical of a management area.

Special areas have been statutorily or administratively designated. See FSH 1909.12, Chapter 10, Section 14. Special areas overlap management areas and may overlap other special areas. They are managed to protect the special features or character for which they were designated and in accordance with relevant law, regulation, policy, and any area-specific management plan (such as the Verde River Comprehensive River Management Plan).

Scenery desired conditions (that is, desired landscape character) for wilderness, wild and scenic rivers, and other special areas are described in a separate document titled Landscape Character Descriptions for the Coconino National Forest, which is located in the project record and on the forest website.

### Management Areas

See appendix A, map 1.

### Painted Desert Management Area

#### General Description and Background for Painted Desert Management Area

This management area (MA) is characterized by views of the Painted Desert in the background. Located in the far northern part of Coconino NF, the Painted Desert MA borders State and private lands and Wupatki National Monument to the north and east, and adjoins the Volcanic Woodlands MA to the south and west. Main roads include U.S. Highway 89 and Forest Road 545. It is about 18 miles north of Flagstaff and 24 miles south of Cameron.

Grassland and pinyon juniper vegetation provides an environment for pronghorn, deer, and other species typical of these habitats. Recreational activities in this relatively remote MA include hiking, mountain biking, scenery-related touring, and wildlife-based recreation. Doney Crater is one of the main trailheads.

This management area has a site density of pueblo, pit house, and agricultural features of several different prehistoric cultures similar to the adjacent Wupatki National Monument. Managed by the National Park Service, this monument was established to protect pueblos and other archaeological resources. In historic times, the Painted Desert MA was part of the region grazed

first, by sheep, and later by cattle. Remains of sheep camps used by Basque, Mexican, and South American shepherds, dot the area. Doney Crater is named after Benjamin Doney, a Civil War veteran who dug numerous archaeological sites in the Wupatki area while searching for a legendary Spanish Mine.

#### **Characteristics of the Painted Desert Management Area\***

Approximate acres: 28,725 acres of National Forest System land

<b>Wilderness (designated):</b> Strawberry Crater Wilderness	<b>Botanical and Geological Areas:</b> none
<b>Wilderness (recommended):</b> Strawberry Crater Wilderness - Addition	<b>Environmental Study Areas:</b> none
<b>Wild and Scenic Rivers (designated):</b> none	<b>Terrestrial Ecological Response Units:</b>
<b>Wild and Scenic Rivers (eligible):</b> none	Great Basin Grassland
<b>Inventoried Roadless Areas:</b> none	Pinyon Juniper with Grass
<b>National Trails:</b> Arizona National Scenic Trail	Pinyon Juniper Woodland
<b>Scenic Roads:</b> none	<b>Riparian Areas:</b> Streams
<b>Research Natural Areas:</b> none	<b>Riparian Forest Types:</b> none
	<b>Landscape Character Zone:</b> Painted Desert
	<b>See also Suitable Uses in Chapter 4</b>

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Painted Desert Management Area**

MA-PntdDsrt-DC

- 1 Cultural sites and remains of prehistoric habitation are preserved and contribute to the unique sense of place.
- 2 Large tracts of unroaded landscape in Deadman Wash provide remote recreational experiences and benefit disturbance-sensitive species.
- 3 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for scenic integrity objectives.

#### **Management Approaches for Painted Desert Management Area**

Coordinate with the National Park Service to develop and ensure compatible management of overlapping resources in this management area.

### **Volcanic Woodlands Management Area**

#### **General Description and Background for Volcanic Woodlands Management Area**

The Volcanic Woodlands MA is characterized by cinder soils and volcanic features associated with the northern and northeastern extents of the San Francisco Peaks volcanic field. Located in

the northern part of the Coconino NF, it is bounded by State and private lands to the north and east; a portion of Interstate 40 to the southeast; and Kaibab NF to the west. It adjoins the Painted Desert, Flagstaff Neighborhoods, Pine Belt, and San Francisco Peaks Management Areas. The Cinder Hills OHV Recreation Area, Painted Desert Vista, Bonita Campground, Red Mountain Geological Area, and Sunset Crater Volcano National Monument are located within the boundaries of this MA. The main roads are U.S. Highway 89, U.S. Highway 180, Forest Road 545, County Road 505 to Leupp, and Interstate 40. It is adjacent to the small communities of Doney Park and Winona.

Vegetation is dominated by pinyon juniper and ponderosa pine with scattered pockets of grassland. This supports deer, pronghorn, and other wildlife species typical of these habitats.

Recreation includes scenery-related activities, wildlife-based recreation, hiking, mountain biking, and motorized recreation.

The cinder belt through this area has a high archaeological density, particularly represented by numerous prehistoric fields and the small stone field houses used during planting and harvesting seasons. This zone is also of traditional importance to the Hopi as the area where their god of the wind resides. In historic times, the area was used for sheep herding and pronghorn hunting by the Navajo.

Volcanic Woodlands MA also contains the last remaining training ground for astronauts in the Apollo Space Program. Between 1967 and 1969, craters were blasted out with dynamite and rocks brought in to simulate the Moon's surface. Here, astronauts learned to walk in space suits and use equipment, such as the rocket belt and lunar rover, to prepare for lunar missions.

#### **Characteristics of the Volcanic Woodlands Management Area\***

Approximate acres: 157,778 acres of National Forest System land

**Wilderness (designated):** Strawberry Crater Wilderness

**Wilderness (recommended):** Strawberry Crater Wilderness – Recommended addition)

**Wild and Scenic River (designated):** none

**Wild and Scenic River (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** Arizona National Scenic Trail

**Scenic Roads:** Route 66 All-American Road, San Francisco Peaks Scenic Road

**Research Natural Areas:** none

**Botanical and Geological Areas:** Red Mountain Geological Area

**Environmental Study Areas:** none

#### **Terrestrial Ecological Response Units:**

Great Basin Grassland

Montane/Subalpine Grassland

Pinyon Juniper with Grass

Pinyon Juniper Woodland

Ponderosa Pine

Mixed Conifer Frequent Fire

#### **Riparian Areas:** Streams, Springs

#### **Riparian Forest Types:**

Mixed Broadleaf Deciduous Riparian Forest

Montane Willow Riparian Forest

**Landscape Character Zone:** Volcanic Woodlands

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### **Desired Conditions for Volcanic Woodlands Management Area**

#### **MA-VolcanWd-DC**

- 1 Outside of the Cinder Hills [Off-highway Vehicle](#) (OHV) Area, volcanic features, such as cinder cones, craters, lava flows, and vents, maintain their integrity, form, and process.
- 2 Volcanic features are recognized for their cultural and religious importance to several tribes.
- 3 The Cinder Hills OHV Area provides opportunities for off-trail motorized recreation. The boundaries of the Cinder Hills OHV Area are clearly delineated and prevent off-road driving outside of the designated area and in the Sunset Crater Volcano National Monument. Clearly worded signs and information are provided to OHV drivers to make clear distinctions between driving rules in the Cinder Hills OHV Area and rules that apply to the cinder cones outside of the OHV area. Connectors provide access to the motorized trails within this area from a number of nearby access points and adjacent motorized trails.
- 4 Large tracts of unroaded landscape in Deadman Wash provide remote recreational experiences and benefit disturbance-sensitive species.
- 5 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for scenic integrity objectives.

### **Guideline for Volcanic Woodlands Management Area**

#### **MA-VolcanWd-G**

- 1 Management activities and permitted uses should be designed to maintain the integrity, form, and processes of volcanic features, outside the Cinder Hills OHV Area.

### **Management Approaches for Volcanic Woodlands Management Area**

Coordinate with the National Park Service to develop and ensure compatible management of overlapping resources in this management area.

Manage motorized recreation in and around the Cinder Hills OHV Area to prevent intrusion on Sunset Crater Volcano National Monument and Strawberry Crater Wilderness Area.

Consult with tribes to identify volcanic features of cultural importance in project planning.

## **Pine Belt Management Area**

### **General Description and Background for Pine Belt Management Area**

Ponderosa pine is the characteristic feature of the large Pine Belt MA, which runs from the northwestern to southern part of the Coconino NF. The Kaibab NF, Navajo Army Depot, and Prescott NF comprise the western boundary and the Mogollon Rim forms part of the southwestern and southern boundaries. Various State land parcels are embedded in the central portion. It adjoins the Anderson Mesa, East Clear Creek, Flagstaff Neighborwoods, Lake Mary Watersheds, Long Valley, Oak Creek Canyon, Red Rock, San Francisco Peaks, Verde Valley, and Volcanic Woodlands Management Areas. Access is provided by U.S. Highway 180, Interstate 17, State Route 89A south, Forest Highway 3, and State Highway 89 north. The MA includes the communities of Munds Park and Mormon Lake, and it is adjacent to Flagstaff. It also contains the Woody Mountain Well Field, which supplies water for the City of Flagstaff.

The Pine Grove Seasonal Closure Area is located in the central part of Coconino NF and situated on the west side of Forest Highway 3 between Upper Lake Mary and Mormon Lake. This seasonal closure area provides opportunities for non-motorized recreation, a high degree of interaction with a backcountry area, and low-disturbance habitat for wildlife.

The Rattlesnake Seasonal Closure Area is bounded by Interstate 17 on the west, then east on Forest Road 80 and Forest Road 239, then south on Forest Road 665 and west on Forest Road 213 back to Interstate 17 at the Stoneman Lake Interchange. See appendix A, map 15. This seasonal closure area provides opportunities for non-motorized recreation, a high degree of interaction with a backcountry area, and low-disturbance habitat for wildlife.

The Woods Seasonal Closure Area is bounded by Munds Mountain Wilderness on the west, then north, northwest to Indian Point, northeast roughly along the rim of Munds Canyon then south along Forest Road 153E, east along Forest Road 153 (Schnebly Hill Road), south along Interstate 17, and then southwest to Munds Mountain Wilderness. See appendix A, map 15. This seasonal closure area minimizes disturbance to big game winter range.

The Woody Ridge Seasonal Closure Area is located in an area occurring south of Woody Mountain bounded on the west by Forest Roads 231, 231L, and 535D, on the east by Forest Road 533 and State Route 89A, south along Woody Ridge to Fry Canyon. See appendix A, map 15. This seasonal closure area provides year-round opportunities for non-motorized recreation, a high degree of interaction with a backcountry area, and low-disturbance habitat for wildlife.

The dominant ponderosa pine vegetation is interspersed with pinyon juniper, grassland, mixed conifer, chaparral, and wetland habitats. This variety of vegetation supports a wide diversity of wildlife including elk, deer, other big and small game species, as well as a variety of birds and waterfowl.

Dispersed and developed recreation opportunities are available. Mountain bike riding, hiking, horseback riding, snowmobiling, and scenery- and wildlife-based recreation are common.

Although this is the dominant management area of the forest, it has very few archaeological sites, likely due to the overall high elevation, cold temperatures, lack of water, and soils that are not well suited for agriculture. It was undoubtedly used for hunting, but evidence of prehistoric hunting is sparse, especially with the dense pine needle cover over much of the MA. Historic sites are more frequently found and are associated with logging and ranching activities. An extensive logging railroad system, used from 1887 to 1966, crosses much of the area, as does the historic Chavez/Palatkwabi Trail. The Mormon Lake area is important to the region as one of the settlements established in northern Arizona by the Mormons in 1876 to 1878, led by Lot Smith, one of the sons of Joseph Smith. Several large, open parks along the northwestern side of this MA—Munds Park, Newman Park, and Clay Park—are named after some of the early settlers of the Sedona area, who used the parks as summer range for their cattle.

Four fire lookouts in the Pine Belt MA—Moqui, Buck Mountain, Mormon Lake, and Lee Butte—are listed on the National Register of Historic Places as classic examples of fire tower architecture and construction techniques. Also listed on the national register are the Saginaw and Manistee Logging Camp No. 2, a logging camp used by Navajo Indians, a railroad trestle, and the Anderson Mesa Incline, a unique switchback that was used to move railroad logging cars down the side of Anderson Mesa above Lake Mary.

### Characteristics of the Pine Belt Management Area\*

Approximate acres: 426,832 acres of National Forest System land

#### **Wilderness (designated):**

Fossil Springs Wilderness  
Kendrick Wilderness  
Munds Mountain Wilderness  
Sycamore Canyon Wilderness  
West Clear Creek Wilderness  
Wet Beaver Wilderness

#### **Wilderness (recommended):** none

#### **Wild and Scenic Rivers (designated):** none

#### **Wild and Scenic Rivers (eligible):**

East Clear Creek (Scenic)  
Oak Creek (Recreational)  
West Clear Creek (Wild)  
West Fork Oak Creek (Wild)  
Wet Beaver Creek (Wild)

#### **Inventoried Roadless Areas:** East Clear Creek, Jacks Canyon

#### **National Trails:** Arizona National Scenic Trail, General George Crook National Recreation Trail

#### **Scenic Roads:** Oak Creek Canyon Scenic Road, Route 66 All-American Road, San Francisco Peaks Scenic Road

#### **Research Natural Areas:** GA Pearson RNA

#### **Botanical and Geological Areas:** Red Mountain Geological Area

#### **Environmental Study Areas:** none

#### **Terrestrial Ecological Response Units:**

Interior Chaparral  
Great Basin Grassland  
Montane/Subalpine Grassland  
Pinyon Juniper with Grass  
Pinyon Juniper Evergreen Shrub  
Pinyon Juniper Woodland  
Ponderosa Pine  
Mixed Conifer Frequent Fire  
Mixed Conifer with Infrequent Fire  
Spruce Fir

#### **Riparian Areas:** Streams, Wetlands, Springs

#### **Riparian Forest Types:**

Cottonwood Willow Riparian Forest  
Mixed Broadleaf Deciduous Riparian Forest  
Montane Willow Riparian Forest

#### **Landscape Character Zone:** Ponderosa Pine

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### Desired Conditions for Pine Belt Management Area

MA-PineBelt-DC

- 1 Functioning wetlands provide nesting and migratory habitat for waterfowl and shorebirds; foraging habitat for peregrine falcons and other raptors; and water for a variety of species.
- 2 Wildlife viewing and hunting opportunities are emphasized in this area.
- 3 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.
- 4 Woody riparian vegetation and riparian habitat in Pumphouse Wash is protected through management of roads, trails, and recreation use.

- 5 Pine Grove Seasonal Closure Area provides opportunities for recreation in a backcountry area that has a low concentration of users and a high degree of interaction with the natural environment that is seasonally undisturbed by vehicles. The area inside the closure is largely unfragmented and natural-appearing. There is little evidence of resource modification. This closure provides wildlife with an environment that has reduced disturbance from motorized vehicles compared to surrounding areas.
- 6 Rattlesnake Seasonal Closure Area provides opportunities for recreation in a backcountry area that has a low concentration of users and a high degree of interaction with the natural environment that is seasonally undisturbed by vehicles. The area is largely unfragmented and natural-appearing. There is little evidence of resource modification. This area provides wildlife with an environment that has reduced disturbance from motorized vehicles compared to surrounding areas.
- 7 Woods Seasonal Closure Area provides opportunities for recreation in a backcountry area that has a low concentration of users and a high degree of interaction with the natural environment that is seasonally undisturbed by vehicles. The area is largely unfragmented and natural-appearing. There is little evidence of resource modification. This area provides wildlife with an environment that has reduced disturbance from motorized vehicles compared to surrounding areas.
- 8 The Woody Ridge Seasonal Closure Area provides opportunities for recreation in a backcountry area that has a low concentration of users and a high degree of interaction with the natural environment that is undisturbed by vehicles. The area is largely unfragmented and natural-appearing. There is little evidence of resource modification. This area provides wildlife with an environment that has reduced disturbance from motorized vehicles compared to surrounding areas.

### **Standards for Pine Belt Management Area**

#### **MA-PineBelt-S**

- 1 Pine Grove Seasonal Closure Area shall be closed to motor vehicle use from August 15 to December 31. Roads within the area are closed, but the roads along the perimeter are open to motorized travel. The purpose of the closure is to provide opportunities for recreation in areas undisturbed by vehicles.
- 2 Rattlesnake Seasonal Closure Area shall be closed to motor vehicle use from August 15 to December 31. Roads within the area are closed, but the roads along the perimeter are open to motorized travel. The purpose of the closure is to provide opportunities for recreation in areas undisturbed by vehicles.
- 3 Woods Seasonal Closure Area shall be closed to motor vehicle use from December 15 to April 1. Roads within the area are closed, but the roads along the perimeter are open to motorized travel. Schnebly Hill Road (Forest Road 153) is not affected by this closure. The purpose of the closure is to minimize disturbance to big game winter habitat.
- 4 Woody Ridge Seasonal Closure Area shall be closed to motor vehicle use year-round. Roads within the area are closed, but the roads along the perimeter are open to motorized travel. The purpose of the closure is to minimize disturbance to wildlife.

## **Guidelines for Pine Belt Management Area**

### **MA-PineBelt-G**

- 1 In Pumphouse Wash, roads and trails should be managed to decrease erosion and reduce sedimentation that could flow down canyon and into Oak Creek Canyon. This is intended to improve and maintain watershed conditions and rare plant communities.

## **San Francisco Peaks Management Area**

### **General Description and Background for San Francisco Peaks Management Area**

The San Francisco Peaks are the major feature in the San Francisco Peaks MA. This MA occurs in the northern part of the Coconino NF. It is accessed and bounded by U.S. Highway 180 to the west and Forest Road 418 to the north. Other main access roads include U.S. Highway 89 and Forest Road 545. It adjoins the Flagstaff Neighborwoods, Fort Valley/Mount Elden, Inner Basin, Pine Belt, and Volcanic Woodlands Management Areas as well as Sunset Crater Volcano National Monument, and is located about 5 miles north of Flagstaff. It includes the Kachina Peaks Wilderness and Humphreys Peak, the highest point in Arizona, and a popular hiking destination. It also includes the Fern Mountain Botanical Area, which adjoins the Nature Conservancy's Hart Prairie Preserve. The Botanical Area and Hart Prairie Preserve focus on the preservation of a high-elevation riparian scrub community dominated by Bebb's willow. Private land parcels are scattered on the western and northern sides of the MA.

The Nordic Ski Center Seasonal Closure Area is bounded by U.S. Highway 180 on the west. It is north of Forest Road 794, south of Kendrick Park, and Forest Road 151E runs through it. See appendix A, map 15. This seasonal closure area provides opportunities for winter recreation in an area undisturbed by motorized vehicles.

Dominant vegetation includes mixed conifer, ponderosa pine, and spruce fir forests punctuated with grassland, pinyon juniper, and alpine tundra. This is the only alpine tundra, bristlecone pine, corkbark fir, spruce fir, and high-elevation grassland vegetation on the forest. It is also the only alpine tundra on National Forest System lands in Arizona, and one of the few locations in the state for bristlecone pine and spruce fir. These high-elevation vegetation communities provide habitat for an assemblage of species not found elsewhere on the forest, as well as habitat for a variety of other species associated with these habitats.

Aspen viewing is popular in the fall, especially in Hart Prairie and the Inner Basin. Major recreation points are Arizona Snowbowl, the Nordic Ski Center, a developed campground in the Inner Basin, and the Arizona National Scenic Trail. This MA is popular for big game hunting and a focal area for collaborative management between Coconino NF and the Arizona Game and Fish Department.

The San Francisco Peaks and several other mountains demarcate the boundaries of the traditional and sacred heartland of the Hopi, Navajo, Zuni, Acoma, Apache, Havasupai, and Hualapai. Many tribes continue to conduct centuries-old religious observances on the San Francisco Peaks that are central to their culture and religion. Most of the MA is within the San Francisco Peaks Traditional Cultural Property and has been determined eligible for the National Register of Historic Places.

Other historic features in this MA include homestead cabins and C. Hart Merriam's base camp, a National Historic Landmark. C. Hart Merriam, an early zoologist, selected San Francisco



Mountain as his study area because of its geographic location and variety of vegetation. His work in 1889 led to wide acceptance of the concept of life zones.

#### **Characteristics of the San Francisco Peaks Management Area\***

Approximate acres: 57,861 acres of National Forest System land

**Wilderness (designated):** Kachina Peaks  
Wilderness

**Wilderness (recommended):** Abineau  
Wilderness (Recommended)

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** Arizona National Scenic  
Trail

**Scenic Roads:** San Francisco Peaks Scenic  
Road

**Research Natural Areas:** San Francisco  
Peaks RNA and a proposed addition to the  
San Francisco Peaks RNA

**Botanical and Geological Areas:** Fern  
Mountain Botanical Area

**Environmental Study Areas:** none

#### **Terrestrial Ecological Response Units:**

Montane/Subalpine Grassland

Pinyon Juniper with Grass

Pinyon Juniper Woodland

Ponderosa Pine

Mixed Conifer Frequent Fire

Mixed Conifer with Infrequent  
Fire

Spruce Fir

Alpine Tundra

#### **Riparian Areas:** Springs, Streams

#### **Riparian Forest Types:**

Montane Willow Riparian Forest

**Landscape Character Zone:** San Francisco  
Peaks

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for San Francisco Peaks Management Area**

MA-Peaks-DC

- 1 The San Francisco Peaks provide a traditional cultural and religious setting for many American Indian tribes and are recognized as sacred to these tribes.
- 2 This area offers a diverse range of year-round recreation opportunities and settings that provide for quiet and solitude as well as higher levels of visitor use in developed settings. Wildlife-based recreation opportunities are abundant in this area.
- 3 Remains of the historic exploration and homesteading activity are preserved and contribute to the unique sense of place.
- 4 The Waterline Road (Forest Road 146) provides access for the City of Flagstaff to operate and maintain the Inner Basin water supply and associated infrastructure.
- 5 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for scenic integrity objectives.

- 6 The Nordic Ski Center Seasonal Closure Area provides opportunities for cross-country skiing within an environment that is seasonally undisturbed by motorized vehicles.

### **Standards for San Francisco Peaks Management Area**

#### **MA-Peaks-S**

- 1 Horse and pack stock, except for limited administrative use, are not allowed on Humphrey's Trail and Weatherford Trail above Doyle Saddle.
- 2 The Nordic Ski Center Seasonal Closure Area shall be closed to motor vehicle use from December 1 to March 31.
- 3 Recreational livestock use such as horses, pack stock, mules, or llamas are not permitted in the watersheds draining into the Inner Basin MA.

### **Guidelines for San Francisco Peaks Management Area**

#### **MA-Peaks-G**

- 1 The Waterline Road should be managed as a non-motorized recreation corridor to limit motorized intrusion into wilderness.
- 2 Special use events should occur on Snowbowl Road infrequently and should not interfere with the use of the area by the general public or permittees near the Snowbowl Ski Area in order to preserve public access to the mountain and facilities.

## **Inner Basin Management Area**

### **General Description and Background for Inner Basin Management Area**

The east-facing Inner Basin of the San Francisco Peaks is the main feature of this MA. It is surrounded by the San Francisco Peaks Management Area in the north central part of the forest. Forest Road 552 is the main access route leading to popular Lockett Meadow and the associated campground and trailheads. Flagstaff is the nearest community.

Vegetation is dominated by spruce fir and mixed conifer, and aspen is locally abundant. These habitats support wildlife communities typical of these high-elevation forests.

The wells and most of the springs in this MA supply water for the City of Flagstaff in Coconino County. Buildings and pipelines support water pumping and transport. Forest Roads 146, 6437, and 533 are used by City and Federal personnel to access and administer the MA.

This MA is a popular recreation area for day hiking, mountain biking, backcountry skiing, wildlife-related recreation, and aspen viewing.

**Characteristics of the Inner Basin Management Area\***

Approximate acres: 1,057 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** none

**Scenic Roads:** none

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

**Terrestrial Ecological Response Units:**

Montane/Subalpine Grassland

Mixed Conifer with Infrequent Fire

Spruce Fir

Alpine Tundra

**Riparian Areas:** Streams

**Riparian Forest Types:** none

**Landscape Character Zone:** San Francisco Peaks

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

**Desired Conditions for Inner Basin Management Area**

MA-InBsn-DC

- 1 Watersheds are functioning properly and are resilient to natural and human disturbances.
- 2 Vegetation, soil, and riparian areas function to facilitate precipitation infiltration and groundwater recharge.
- 3 Water quality meets or exceeds Arizona water quality standards and supports domestic beneficial use.
- 4 There is low risk of substantial damage from uncharacteristic fire and recreation to water supply, infrastructure, water quality, visual quality, and cultural integrity (tribes and local communities).
- 5 A sustainable mix of dispersed and developed recreational opportunities is provided in balance with functioning watershed, soil, and vegetative conditions.
- 6 Steep slopes and other hard-to-access areas provide solitude and more primitive non-motorized recreation opportunities than adjoining areas with easier access. These areas also provide low-disturbance wildlife habitat.
- 7 The Waterline Road (Forest Road 146), Forest Road 6437, and the portion of Forest Road 553 from Lockett Meadow to the Waterline Road provide access for the City of Flagstaff to operate and maintain the Inner Basin water supply and associated infrastructure.
- 8 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Standards for the Inner Basin Management Area**

#### **MA-InBsn-S**

- 1 Recreational livestock such as horses, pack stock, mules, or llamas are not permitted in the Inner Basin MA above the watershed cabin.

### **Guidelines for Inner Basin Management Area**

#### **MA-InBsn-G**

- 1 Spring recharge areas, where known, should be managed to maintain or improve spring discharge.
- 2 Projects and activities should be designed and implemented to maintain or improve watershed, riparian, and spring function; and/or prevent the introduction or spread of disease and invasive or undesirable species. Design features could include fencing certain areas, managing motorized access, limiting certain types of recreation, or area closure.
- 3 Where a structure is in place to use water from a spring as a water source or when designing restoration projects, priority should be given to protecting spring source areas and riparian habitat to safeguard the unique ecological and biophysical characteristics, higher biodiversity, endemic species, water quality, and cultural values associated with spring sources. This should be consistent with existing water rights. For example, water could be piped out of the riparian area to avoid negative impacts to soil, water, and vegetation.
- 4 Roads and trails should be maintained to prevent erosion and sedimentation, and to protect existing infrastructure.
- 5 To limit motorized intrusion into wilderness and to protect the watersheds, motorized access should be restricted to authorized vehicles necessary for area administration on Waterline Road (Forest Road 146), Forest Road 6437, and the portion of Forest Road 553 from Lockett Meadow to the Waterline Road.
- 6 Vegetation treatments should be planned only when needed by other resources, or to control significant insect or disease outbreaks.
- 7 Dispersed recreation should be limited to day-use traffic, by foot or bicycle, to maintain water quality and watershed function.

### **Management Approaches for Inner Basin Management Area**

Continue to work with the City of Flagstaff to minimize impacts to forest resources and to rehabilitate impacted areas.

## **Flagstaff Neighborwoods Management Area**

### **General Description and Background for Flagstaff Neighborwoods Management Area**

The Flagstaff Neighborwoods MA is characterized by the wildland-urban interface that surrounds the City of Flagstaff and outlying communities. Flagstaff Neighborwoods MA is bounded by the adjoining Anderson Mesa, Fort Valley/Mount Elden, Lake Mary Watersheds, Pine Belt, San Francisco Peaks, Volcanic Woodlands, and Walnut Canyon Management Areas. Main roads include Interstate 17, Interstate 40, State Route 89A north, State Route 89A south, and State

Highway 180. Besides Flagstaff, this MA includes the communities of Kachina Village, Mountaineer, Cosnino, Winona, Doney Park, Fernwood, and Timberline, and borders several sections of State land.

Dominant vegetation is ponderosa pine and pinyon juniper with scattered grassland, mixed conifer, and wetlands. These habitats support a variety of wildlife including those adapted to more urban situations.

Key areas adjacent to the Flagstaff Neighborwoods MA include Lowell Observatory, the Naval Observatory Flagstaff Station, the Observatory Mesa Natural Area, Picture Canyon, and Fort Tuthill. There is a network of City, County, and Forest Service trails that connect to and provide access to these popular areas as well as the general forest. Popular recreation activities include hiking, mountain biking, rock climbing, and horseback riding.

There are two environmental study areas (ESA) in this management area. ESAs are locations on the forest that are set aside from development for the purpose of environmental education. The 761-acre Old Caves Crater ESA is located north of Silver Saddle Road, east of U.S. Highway 89, and adjacent to the Doney Park communities. Old Caves Crater is a popular destination through ponderosa pine for scenic views and visiting archaeological sites. The 321-acre Griffith's Spring ESA is located south of Flagstaff on State Route 89A, adjacent to the Forest Highlands community and just south of Pine Dell. Griffith's Spring ESA provides an easy walk through ponderosa pine to a meadow and an ephemeral stream channel with riparian vegetation.

Archaeological site density in this MA is variable, ranging from low, in the ponderosa pine zone forming its southern and western sides, to very high, in the juniper woodlands on the east. It contains a wide range of site types that represent most of the 800 years of occupation by prehistoric agriculturalists. The major archaeological concepts for the region were formed during the excavation of sites in this MA during the 1930s, particularly in the area near Winona, where the Winona Village National Landmark, and the nearby Ridge Ruin National Register District are located.

In the northern part of the MA, the area around the base of Mount Elden has a high site density consisting mostly of pit house settlements dating to the A.D. 1070 to 1150 period. It is also the location of Elden Pueblo, the classic example of prehistoric life in the area in the A.D. 1150 to 1275 period. Public reaction to the excavation of this site by the Smithsonian Institution in 1926 led to the formation of the Museum of Northern Arizona, recognized world-wide for its significant scientific research. Elden Pueblo is listed on the National Register of Historic Places and is the center piece of the Coconino NF's multi-award-winning public archaeology program.

Historically, the area is associated with the Euro-American settlement of the area in the 1860s, the development of the railroad in the 1880s, the growth of the logging industry, and as the location of many educational and scientific institutions.

### Characteristics of the Flagstaff Neighborwoods Management Area\*

Approximate acres: 53,105 acres of NFS land

**Wilderness (designated):** none  
**Wilderness (recommended):** none  
**Wild and Scenic Rivers (designated):** none  
**Wild and Scenic Rivers (eligible):** none  
**Inventoried Roadless Areas:** none  
**National Trails:** Arizona National Scenic Trail  
**Scenic Roads:** Route 66 All-American Road, San Francisco Peaks Scenic Road  
**Research Natural Areas:** G A Pearson RNA  
**Botanical and Geological Areas:** none  
**Environmental Study Areas:** Griffith's Spring ESA, Old Caves Crater ESA

**Terrestrial Ecological Response Units:**  
Great Basin Grassland  
Montane/Subalpine Grassland  
Pinyon Juniper with Grass  
Pinyon Juniper Woodland  
Ponderosa Pine  
Mixed Conifer Frequent Fire  
**Riparian Areas:** Wetland, Springs, Streams  
**Riparian Forest Types:**  
Montane Willow Riparian Forest  
**Landscape Character Zone:** Ponderosa Pine  
**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### Desired Conditions for Flagstaff Neighborwoods Management Area

MA-FlagN-DC

- 1 Recreation opportunities near Flagstaff emphasize day and overnight dispersed recreation opportunities with few developed facilities, except in established developed campgrounds.
- 2 An interconnected trail system is accessible through strategically located trailheads and connector trails. The National Forest System trail system connects to the Flagstaff Urban Trail System, Flagstaff Loop Trail, and/or Coconino County trails to provide continuous access to urban recreation opportunities.
- 3 Many trails in this area provide easy to moderate recreation opportunities.
- 4 Remote recreation opportunities are maintained as new development occurs within this management area.
- 5 Passthrough corridors for motorized recreation provide connections with motorized trail systems or secondary forest system roads.
- 6 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for scenic integrity objectives.
- 7 The Griffith's Spring and Old Caves ESAs provide interpretive and environmental educational opportunities for students, residents, and forest visitors consistent with other resource desired conditions. Non-motorized trails associated with these ESAs provide dispersed day-use and safe access.

### **Objectives for Flagstaff Neighborwoods Management Area**

#### **MA-FlagN-O**

- 1 Create three additional connections with the Flagstaff Urban Trail System, Flagstaff Loop Trail, and/or Coconino County trails within 10 years of plan approval.

### **Standards for Flagstaff Neighborwoods Management Area**

#### **MA-FlagN-S**

- 1 Horse and pack stock, except for limited administrative use, are not allowed on the portion of the Oldham Trail between Buffalo Park and the El Paso natural gas pipeline.

### **Guidelines for Flagstaff Neighborwoods Management Area**

#### **MA-FlagN-G**

- 1 Management activities and new special uses and amendments within the environmental study areas should be designed to retain and promote educational and learning opportunities about forest resources and the character of these areas.
- 2 New transmission corridors should avoid the ESAs to protect educational resources and settings.
- 3 The ESAs should be managed to provide for minimal user conflicts.

### **Management Approaches for Flagstaff Neighborwoods Management Area**

Engage in strong community partnerships for stewardship of the Flagstaff Neighborwoods MA to support resident health, safety, and quality of life.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns.

Collaborate with the Arizona Game and Fish Department to educate residents about living with wildlife in urban areas.

Elden Pueblo public program provides one-on-one, hands-on, experiential archaeology for school children and the public in partnership with the Flagstaff School System, Arizona Natural History Association, Arizona Archaeological Society, and Museum of Northern Arizona.

Coordinate with schools and youth organizations in Flagstaff and the surrounding areas to develop curriculums and opportunities for students to learn about forest resources related to ESAs.

Coordinate with Arizona Game and Fish Department, Museum of Northern Arizona, volunteers, and other agencies and organizations to strengthen partnerships and develop interpretive opportunities and materials for learning about forest resources within ESAs.

Collaborate with ESA user groups when planning, designing, and constructing trails and interpretive resources related to these areas.

## **Mount Elden Management Area**

### **General Description and Background for Mount Elden Management Area**

Main features of this MA are Mount Elden and Dry Lake Hills. The Mount Elden MA is north of Flagstaff, south of the Kachina Peaks Wilderness, and adjoins the Flagstaff Neighborwoods and San Francisco Peaks Management Areas. Main roads are State Route 180 and State Route 89A north. It contains part of the Fort Valley Experimental Forest that is managed by the Rocky Mountain Research Station.

The 495-acre Mount Elden Environmental Study Area (ESA) is located at the base of Mount Elden, adjacent to the subdivisions of Shadow Mountain, Paradise Hills, Skyline Estates, and Swiss Manor, and adjacent to Buffalo Park. Environmental study areas are locations on the forest that are set aside from development for the purpose of environmental education. Originally a bird sanctuary, Mount Elden ESA is a popular daytime destination for hiking, dog walking, mountain biking, and horse riding. The El Paso Natural Gas pipeline crosses the area.

Dominant vegetation is ponderosa pine, with mixed conifer and grassland habitat in a few locations. This vegetation supports deer, elk, and other species typical of these habitats.

It provides a wide variety of motorized and non-motorized recreation experiences that can be easily accessed from city parks and the Flagstaff Urban Trail System. This area receives high day-use recreation, primarily due to the close proximity to Flagstaff.

Mount Elden is the dominant feature along the eastern end of the MA. It is named after John Elden, a sheep herder who settled at the base of Mount Elden in 1877. Mount Elden is also part of the San Francisco Peaks Traditional Cultural Property because of its traditional significance to the Hopi. This area is unique in having the highest number of archaeological sites within the entire ponderosa pine zone of the Coconino NF. Site density is about 35 sites per square mile and consists mostly of pit house settlements and scattered small pueblos that date to the time immediately after the eruption of Sunset Crater Volcano in the late 11th century. It is likely that many of these sites may have been established by people who had to move out of the area devastated by the eruption and the thick cinder dunes that buried much of the land they had occupied. There are only a few pueblos that date to later times, A.D. 1150 to 1275, with the largest of these being the National Register site of Elden Pueblo. Elden Pueblo was partially excavated in 1926, by the Smithsonian Institution, and has been developed in recent years by the Coconino as one of its premier Heritage Sites, where many interpretive and educational programs are made available for school children and the general public each year.

Moving into the central and western portions of the MA, the elevation becomes increasingly higher than that of the east end. Accompanying this rise in elevation is a rapid decrease in prehistoric sites to less than five sites per square mile due to the high elevation, which has a growing season too short for most crops. However, there are a number of sites associated with the early historic period development of Flagstaff. Just outside the MA is Fort Valley itself, named after a settlement established there in 1877 by John Young, one of the sons of Brigham Young, to cut ties for the railroad that was being developed across the country. Other sites represent the main historic use of the area, starting in the 1880s, for logging, and the development of homesteads for farming, sheep herding, and cattle grazing.

Fort Valley, and the western end of the management area, is also the location of the Fort Valley Experimental Station, established in 1908 as the first forest experiment station in the Nation, and



listed on the National Register of Historic Places. It is a scientific center that conducts research related to the regeneration of ponderosa pine. Its facilities at one time included the LeRoux Springs nursery, which grew thousands of trees used in reforestation of the area by the Civilian Conservation Corps in the 1930s.

#### **Characteristics of the Mount Elden Management Area\***

Approximate acres: 17,774 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** Arizona National Scenic Trail

**Scenic Roads:** none

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** Mount Elden ESA

**Terrestrial Ecological Response Units:**

Montane/Subalpine Grassland

Ponderosa Pine

Mixed Conifer with Infrequent Fire

**Riparian Areas:** Wetlands, Streams

**Riparian Forest Types:** none

**Landscape Character Zone:** Ponderosa Pine

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Mount Elden Management Area**

MA-MtElden-DC

- 1 The trail system is designed to be sustainable while balancing user experiences and impacts.
- 2 Throughout this area, trailheads provide access to motorized and non-motorized trails.
- 3 The Fort Valley Trail System offers a variety of trail experiences for motorized and non-motorized recreation.
- 4 The Mount Elden/Dry Lake Hills Trail System offers a variety of trail experiences for non-motorized recreation.
- 5 The Waterline Road (Forest Road 146) provides access for the City of Flagstaff to operate and maintain the Inner Basin water supply and associated infrastructure.
- 6 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.
- 7 The Mount Elden ESA provides interpretive and environmental educational opportunities for students, residents, and forest visitors consistent with other resource desired conditions. Non-motorized trails associated with the Mount Elden ESA provide dispersed day-use and safe access.

### **Standards for Mount Elden Management Area**

#### **MA-MtElden-S**

- 1 Horse and pack stock, except for limited administrative use, are not allowed on the Elden Lookout Trail and the portion of the Oldham Trail between Buffalo Park and the El Paso natural gas pipeline.

### **Guidelines for Mount Elden Management Area**

#### **MA-MtElden-G**

- 1 Trailheads should be designed and located to manage access and to provide interpretive materials to the most visitors possible.
- 2 The base of Mount Elden should be managed primarily for non-motorized recreation opportunities to protect wildlife habitat and cultural sites.
- 3 The Waterline Road should be managed as a non-motorized recreation corridor to limit motorized intrusion into wilderness.
- 4 Management activities within the ESA should be designed to retain and promote educational and learning opportunities about forest resources.
- 5 New special use authorizations and amendments should be limited to those that would not adversely affect the character of the ESA in order to retain the interpretive and educational opportunities and resources of the area.
- 6 New transmission corridors should avoid the ESA to protect educational resources and settings.
- 7 The ESA should be managed to provide for minimal user conflicts.

### **Management Approaches for Mount Elden Management Area**

Engage in strong community partnerships for stewardship of the Mount Elden MA to support resident health, safety, and quality of life.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns.

Collaborate with the Arizona Game and Fish Department to educate residents about living with wildlife in urban areas.

Coordinate with schools and youth organizations in Flagstaff and the surrounding areas to develop curriculums and opportunities for students to learn about forest resources related to the ESA.

Coordinate with Arizona Game and Fish Department, Museum of Northern Arizona, volunteers, and other agencies and organizations to strengthen partnerships and develop interpretive opportunities and materials for learning about forest resources within the ESA.

Collaborate with ESA user groups when planning, designing, and constructing trails and interpretive resources related to these areas.

## Walnut Canyon Management Area

### General Description and Background for Walnut Canyon Management Area

Walnut Canyon is the main feature in this MA, running from the end of Lower Lake Mary to Fisher Point and turning east toward Winona. Portions of this management area are bounded by Interstate 40 to the north; Forest Highway 3 to the southwest; and Forest Road 128 to the southeast. It adjoins the Anderson Mesa, Flagstaff Neighborwoods, Pine Belt, and Lake Mary Watersheds Management Areas, and surrounds Walnut Canyon National Monument. It is only a few miles from the City of Flagstaff.

Ponderosa pine is the dominant vegetation. Pinyon juniper and grasslands occur in scattered locations. It provides habitat for species typically associated with these ecosystems as well as for species accustomed to the rugged low-disturbance environments within Walnut Canyon National Monument.

Despite its proximity to Flagstaff and some popular access points, more remote dispersed recreation opportunities exist. There are National Forest System trails, including the Arizona National Scenic Trail, in the canyon itself and along the rim. Fisher Point is a popular destination and Canyon Vista is popular for climbing. The area south and west of Walnut Canyon provides dispersed recreation opportunities and receives heavy use adjacent to private land and Lake Mary Road. Activities include hiking, horseback riding, and mountain biking.

Recent archaeological surveys have found a site density of 60 sites per square mile, a density similar to that found in Wupatki National Monument and other high-density areas on the forest. In historic times, the cliff dwellings of the canyon attracted visitors from around the world, as they do today. At the eastern side of the Monument is Walnut Canyon Dam, which blocked water in the canyon to create a water source for the railroad. The canyon is also an important feature in the origin traditions of the Hopi and Navajo.

### Characteristics of the Walnut Canyon Management Area\*

Approximate acres: 21,723 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails** Arizona National Scenic Trail

**Scenic Roads:** none

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

### Terrestrial Ecological Response Units:

Great Basin Grassland

Montane/Subalpine Grassland

Pinyon Juniper with Grass

Pinyon Juniper Woodland

Ponderosa Pine

**Riparian Areas:** Springs, Streams

### Riparian Forest Types:

Montane Willow Riparian Forest

**Landscape Character Zone:** Ponderosa Pine

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### **Desired Conditions for Walnut Canyon Management Area**

#### **MA-Walnut-DC**

- 1 The Canyon Vista area provides parking, day-use trails, and overnight camping in developed campgrounds for individuals and groups. Facilities at the site limit resource impacts and provide experiences at the less developed end of the spectrum for developed campgrounds.
- 2 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Standards for Walnut Canyon Management Area**

#### **MA-Walnut-S**

- 1 No new paved roads or utility corridors occur except on the boundaries of the Walnut Canyon MA.
- 2 In the Walnut Canyon MA, national forest jurisdiction will be maintained for all National Forest System lands. No land exchanges will occur unless the purpose is to acquire land within this management area through exchange of National Forest System lands elsewhere.

### **Guidelines for Walnut Canyon Management Area**

#### **MA-Walnut-G**

- 1 Activities and uses on the Coconino NF should be managed to protect cultural sites and to preserve habitat for disturbance-sensitive species both on the forest and within Walnut Canyon National Monument.
- 2 A permit should be required for research projects in rock shelters and archaeological site caves to protect archaeological and historical resources.

### **Management Approaches for Walnut Canyon Management Area**

Coordinate with the Walnut Canyon National Monument to develop and ensure compatible management of overlapping resources in this management area.

## **Anderson Mesa Management Area**

### **General Description and Background for Anderson Mesa Management Area**

This large MA is characterized by grasslands, pinyon juniper, and wetlands on a large, relatively flat mesa located on the western border of the Coconino NF. It is bounded by Interstate 40 and the Walnut Canyon MA to the north; State and private lands along the western boundary; part of Leonard Canyon to the southeast; and Forest Highway 3 and Forest Road 124H along portions of the west side. Anderson Mesa MA adjoins the East Clear Creek, Flagstaff, Neighborwoods, Lake Mary Watersheds, Long Valley, Pine Belt, Volcanic Woodlands, and Walnut Canyon Management Areas. Main access routes are Forest Highway 3 and State Highway 87. Flagstaff and Winslow are the nearest large communities. The Lowell Observatory Anderson Mesa astronomical observatory is located in the northern portion of the MA.

It is dominated by pinyon juniper, grassland, and ponderosa pine vegetation and is an important pronghorn habitat area. Numerous wetlands provide waterbird and wildlife habitat. It contains the Anderson Mesa Important Bird and Biodiversity Area.

This area is known for wildlife-based recreation such as hunting, fishing, and wildlife viewing as well as hiking, mountain biking, motorized recreation, rock climbing, and horseback riding. Reservoirs such as Long Lake, Kinnikinnick Lake, Ashurst Lake, and Soldier Lake are developed recreation sites.

Anderson Mesa is the location of six large pueblos that are the last archaeological expression of the prehistoric Sinagua culture as it transformed into the Hopi and Zuni cultures in the 1400s. The most important area is the Nuvakwewtaqa National Register District, which besides the long-term occupation throughout prehistory, is also of significance to the Hopi, Zuni, and Navajo. It is crossed by the historic Chavez/Palatkwabi Trail and is also the location of early 20th century homesteads.

#### **Characteristics of the Anderson Mesa Management Area\***

Approximate acres: 272,731 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):**

East Clear Creek (Scenic)

Leonard Canyon (Recreation)

**Inventoried Roadless Areas:** Jacks Canyon, Lower Jacks Canyon, Padre Canyon

**National Trails:** Arizona National Scenic Trail

**Scenic Roads:** Route 66 All-American Road

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

#### **Terrestrial Ecological Response Units:**

Great Basin Grassland

Montane/Subalpine Grassland

Pinyon Juniper with Grass

Pinyon Juniper Woodland

Ponderosa Pine

Mixed Conifer with Infrequent Fire

**Riparian Areas:** Wetlands, Springs, Streams

#### **Riparian Forest Types:**

Mixed Broadleaf Deciduous Forest

Montane Willow Riparian Forest

**Landscape Character Zone:** Anderson Mesa

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Anderson Mesa Management Area**

MA-AMesa-DC

- 1 Roads and trails do not dominate any portion of the landscape and are only provided where necessary for access to the area.
- 2 Wildlife-viewing and hunting opportunities are emphasized.

- 3 The Anderson Mesa pronghorn herd has a sustainable population, is able to move freely across the grasslands and open areas of the forest and woodlands, and can easily access winter range.
- 4 Functioning wetlands provide nesting and migratory habitat for waterfowl and shorebirds; foraging habitat for peregrine falcons and other raptors; and water for a variety of species.
- 5 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

## **Lake Mary Watersheds Management Area**

### **General Description and Background for Lake Mary Watersheds Management Area**

This centrally located MA is generally defined by the two 6th code watersheds that supply water to the City of Flagstaff. These watersheds are: Walnut Creek – Upper Lake Mary and Walnut Creek – Lower Lake Mary. Located about 6 miles south of Flagstaff, this MA also contains the Lake Mary Meadows and Elk Park Meadows subdivisions. This MA adjoins the Anderson Mesa, Flagstaff Neighborwoods, Pine Belt, and Walnut Canyon Management Areas and encompasses two reservoirs: Upper Lake Mary and Lower Lake Mary. Primary access is by way of Forest Highway 3 (Lake Mary Road) and Forest Road 132.

Dominant vegetation is ponderosa pine interspersed with grasslands and mixed conifer. Because of the juxtaposition of the lakes, forest, and grassland with Lake Mary Road, this is some of the best known wildlife viewing on the Forest, particularly for osprey, bald eagles, elk, and waterbirds.

Upper Lake Mary and the Lake Mary Well Field supply water for the City of Flagstaff. Buildings and other infrastructure support water pumping and transport.

This MA is popular for fishing, boating, camping, and wildlife-based recreation. Major recreation points are Lower Lake Mary Picnic Area, Upper Lake Mary boat launch, the Narrows, Pinegrove Campground, and Lakeview Campground. Other recreation features are the Pine Grove Seasonal Closure Area (see appendix A, map 15) and the Arizona National Scenic Trail (see appendix A, map 2).

Lake Mary Road is popular with bicyclists and for high-altitude training.

There are few prehistoric archaeological sites in the Lower Lake Mary Watershed MA. It is better known for its historic period association with the Riordan family, one of the early founders of Flagstaff, and their development of the area for logging. Lake Mary was named after Timothy Riordan's oldest daughter when he erected a dam in Walnut Creek to provide water for his sawmill.

**Characteristics of the Lake Mary Watersheds Management Area\***

Approximate acres: 51,260 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** Arizona National Scenic Trail

**Scenic Roads:** none

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

**Terrestrial Ecological Response Units:**

Great Basin Grassland

Montane/Subalpine Grassland

Pinyon Juniper with Grass

Ponderosa Pine

Mixed Conifer with Infrequent Fire

**Riparian Areas:** Wetlands, Springs, Streams

**Riparian Forest Types:**

Montane Willow Riparian Forest

**Landscape Character Zone:** Ponderosa Pine

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

**Desired Conditions for Lake Mary Watersheds Management Area**

MA-LkMary-DC

- 1 There is low risk of substantial damage from uncharacteristic fire and recreation to water supply, infrastructure, water quality, visual quality, and cultural integrity (such as tribes and local communities).
- 2 Canyons, steep slopes, and the Pine Grove Seasonal Closure Area in this MA provide solitude and more primitive non-motorized recreation opportunities than surrounding areas. These areas also provide low-disturbance wildlife habitat.
- 3 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.
- 4 Pine Grove Seasonal Closure Area provides opportunities for recreation in a backcountry area that has a low concentration of users and a high degree of interaction with the natural environment that is seasonally undisturbed by vehicles. The area inside the closure is largely unfragmented and natural-appearing. There is little evidence of resource modification. This closure provides wildlife with an environment that has reduced disturbance from motorized vehicles compared to surrounding areas.

**Standards for Lake Mary Watersheds Management Area**

MA-LkMary-S

- 1 Pine Grove Seasonal Closure Area shall be closed to motor vehicle use from August 15 to December 31. Roads within the area are closed, but the roads along the perimeter are open to

motorized travel. The purpose of the closure is to provide opportunities for recreation in areas undisturbed by vehicles.

### **Guidelines for Lake Mary Watersheds Management Area**

MA-LkMary-G

- 1 The Lake Mary Watersheds MA should be managed to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity.
- 2 Roads and trails within the Lake Mary Watersheds MA should be maintained to prevent erosion and sedimentation and to protect existing infrastructure.

### **Management Approaches for Lake Mary Watersheds**

Continue the collaboration with the Lake Mary Technical Advisory Group for the purpose of protecting and improving water quality and quantity in the domestic water supply and the downstream Walnut Creek riparian area.

Continue to work with City of Flagstaff to minimize impacts to forest resources and to rehabilitate impacted areas.

Cooperate with the City of Flagstaff and National Park Service to develop study proposals and projects designed to evaluate best management practices, reservoir modifications, and/or operational criteria to address the objectives of maintaining the quality of the water supply and increasing the likelihood of flood flows and improvement of the inner-canyon environment in Walnut Canyon National Monument (per the Stipulation Between The City of Flagstaff and the United States on Behalf of the National Park Service and the Forest Service).

## **Red Rock Management Area**

### **General Description and Background for Red Rock Management Area**

Red Rock Management Area is characterized by the rugged topography and spectacular scenery of the Munds Mountain Wilderness, Sycamore Canyon Wilderness, and Red Rock–Secret Mountain Wilderness. It is located on either side of Sedona and adjoins House Mountain-Lowlands, Pine Belt, Oak Creek Canyon, Sedona Neighborwoods, and Verde Valley Management Areas.

Forest roads that join State Route 89A south and State Route 179 are the main roads to numerous popular trailheads that access the wildernesses. Scattered private land parcels occur throughout the MA.

A variety of ecosystems can be found within the Red Rock MA, including riparian, desert, grasslands, chaparral, forest, and woodlands. West Fork of Oak Creek has been designated as an Outstanding Arizona Water.

This management area has a long history of human habitation and is extremely popular with local residents and visitors. Besides the wildernesses, this MA features miles of recreation trails; the Red Rock All-American Road; the Sedona/Oak Creek Scenic Road; and the Wilson Mountain National Recreation Trail.



The Red Rocks area is recognized as one of the major prehistoric pictograph localities in the Southwest. Many of the alcoves in the canyons have pictographs as well as incised designs that range from 9,000 B.C. to historic times. The most abundant styles are attributed to the prehistoric Southern Sinagua whose occupation in the Red Rock country peaked between A.D. 1150 and 1300. Today, they are best known for their large cliff dwellings—Honanki and Palatki—sites that are popular tourist attractions today. Honanki is listed on the National Register of Historic Places as the best example of its time period.

Historic settlement of the area began in the late 1800s, when ranches and farms were established along Oak Creek and other permanent streams.

#### **Characteristics of the Red Rock Management Area\***

Approximate acres: 105,599 acres of National Forest System land

##### **Wilderness (designated):**

Munds Mountain Wilderness  
Red Rock-Secret Mountain Wilderness  
Sycamore Canyon Wilderness

##### **Wilderness (recommended):** none

##### **Wild and Scenic Rivers (designated):** none

##### **Wild and Scenic Rivers (eligible):**

Oak Creek (Recreational)  
Sycamore Creek (Wild)  
West Fork Oak Creek (Wild)

##### **Inventoried Roadless Areas:** none

**National Trails:** Wilson Mountain National Recreation Trail

**Scenic Roads:** Oak Creek Canyon Scenic Road, Red-Rock All-American Road

**Research Natural Areas:** Casner Canyon RNA, Oak Creek RNA

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

##### **Terrestrial Ecological Response Units:**

Desert Communities  
Semi-desert Grassland  
Interior Chaparral  
Pinyon Juniper Evergreen Shrub  
Pinyon Juniper Woodland  
Montane/Subalpine Grassland  
Ponderosa Pine  
Mixed Conifer Frequent Fire

**Riparian Areas:** Streams, Springs

##### **Riparian Forest Types:**

Mixed Broadleaf Deciduous Riparian Forest  
Montane Willow Riparian Forest

**Landscape Character Zone:** Red Rock

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Red Rock Management Area**

MA-RedRock-DC

- 1 High-quality opportunities are provided and maintained for people to enjoy the Red Rock MA's many scenic, historic, and aesthetic qualities including unaltered vistas of red rock cliffs. Scenic views from primary viewing areas, such as highways, recreation sites, trails, and residential areas are natural and natural-appearing landscapes.

- 2 Recreation experiences are primarily based on natural and cultural opportunities, and are in balance with other forest resources.
- 3 A network of primarily non-motorized trails provides opportunities at multiple development levels for hikers and equestrians, as well as opportunities for OHV recreationists and mountain bikers outside of wilderness, while helping protect fragile natural resources and community relationships. Non-motorized trails provide access to the landscape for the community.
- 4 Day-use activities can be found throughout the management area. Self-directed, day-use activities provide interpretation about the natural and cultural history of the management area.
- 5 At primary forest gateways, vistas, and trailheads, facilities serve large numbers of people while sustaining the natural environment, serving as platforms for viewing the outstanding scenery, and providing interpretation to forest visitors.
- 6 Dispersed settings provide opportunities for inspiration, contemplation, and quiet in uncrowded, natural landscapes.
- 7 Social encounters in an area, road or trail are consistent with ROS settings. See FW-Rec-All-DC-4.
- 8 Opportunities are provided for motorists to safely stop along main roads to view the spectacular scenery and experience Red Rock Country. Roadside facilities are designed and placed to provide safe scenic viewing and photo opportunities.
- 9 Schnebly Hill Road is managed as a more primitive roadway and recreational experience and not as an alternative route between Interstate 17 and Sedona.
- 10 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Standards for Red Rock Management Area**

#### **MA-RedRock-S**

- 1 Prohibit dogs at developed heritage interpretive sites.
- 2 Allow four-wheel-drive use along the Casner Powerline access road through a special use permit system consistent with ROS goals and adjacent wilderness, wildlife objectives, soil protection, and where such use does not interfere with Arizona Public Service powerline access needs.
- 3 Due to limited space, four-wheel-drive groups are not allowed to camp along the Casner Powerline Road between the two gates.
- 4 Do not permit commercial tours on Casner Powerline Road.
- 5 Do not permit new outfitter-guide permits in areas that are at or approaching capacity.
- 6 Commercial plant collection activities shall not be authorized in the Red Rock MA; however, removal of other commercial forest products is by permit at designated locations only.

- 7 Land exchanges that dispose of National Forest System land in the Red Rock MA will occur only if they result in acquisition of National Forest System lands in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, or House Mountain-Lowlands MAs.
- 8 [Base-for-exchange](#) lands shall be National Forest System lands located at The Dells area (up to 300 acres, Red Rock MA and House Mountain-Lowlands MA). Land exchanges that dispose of National Forest System land in The Dells area will occur only if they result in acquisition of high-priority private parcels elsewhere in the Red Rock, Oak Creek, House Mountain-Lowlands, and Sedona Neighborwoods MAs. The high-priority land acquisition parcels are Lincoln Canyon (25 acres) and Hancock Ranch (70.3 acres) (see appendix A, map 11).
- 9 Horse and pack stock, except for limited administrative use, are not allowed on the Fay Canyon, Wilson Mountain, West Fork of Oak Creek, and Devil's Bridge trails as well as the Boynton Canyon Trail within Red Rock–Secret Mountain Wilderness.

### **Guidelines for Red Rock Management Area**

#### **MA-RedRock-G**

- 1 A consistent design style should be used for interpretive and informational signs and kiosks, but also allow for individual site distinctiveness in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, and House Mountain-Lowlands MAs.
- 2 Roads should be maintained at the lowest standard possible consistent with safety and the desired recreation experience. Some forest roads, such as Schnebly Hill Road and Forest Road 152 (near Dry Creek), should be managed for safety and minimum standards to maintain rough conditions, low traffic speeds, and the challenging, narrow character of the roadway.
- 3 Aircraft activities related to commercial filming should be designed to minimize impacts to residential areas and primitive recreational opportunities.
- 4 Camping and campfire restrictions should be maintained to protect property and unique resources near roadways and neighborhoods and for the Dry Creek Basin and designated special areas.
- 5 The parking, staging areas, and main four-wheel drive road at Broken Arrow Basin should be managed for the ROS setting of “rural” because of the area’s high level of use. The physical setting and maintenance level of the road should be managed as semi-primitive motorized to be consistent with the surrounding area.
- 6 Roadway features such as signs, guardrails, and landscaping along Highway 179 should be designed to maintain the desired scenic character along the route.
- 7 Although the ROS objectives at Palatki and Honanki are the same as the surrounding management area, the maximum desired number of encounters should be three to four groups<sup>14</sup> per hour, because of the lower capacity of these sites to handle visitation without damage to cultural values.

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<sup>14</sup> A group is defined as six or fewer people.

- 8 When possible, priority parcels in the Red Rock MA (Lincoln Canyon and Hancock Ranch) (see appendix A, map 11) should be acquired through methods other than land exchanges to preserve the National Forest System land base within this MA.
- 9 Disposal of National Forest System lands in the Red Rock, Oak Creek Canyon, Sedona Neighborwoods, and House Mountain-Lowlands MAs to resolve encroachment issues or provide lands needed for public purposes should be limited to parcels 10 acres or less to maximize the retention of National Forest System lands in these MAs.

### **Management Approaches for Red Rock Management Area**

Collaborate with motorized outfitter-guides to maintain and protect resources associated with areas, roads, and/or facilities that receive high use by commercial tour activities.

Through collaboration with outfitter-guides, develop and provide a commercial guide training program on a regular basis to focus on national forest goals, regulations, Leave No Trace, Tread Lightly, and natural and cultural history.

Collaborate with Arizona State Parks to better meet visitor needs and protect resources in the vicinity of Slide Rock State Park, and Red Rock State Park.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns.

### **Oak Creek Canyon Management Area**

#### **General Description and Background for Oak Creek Canyon Management Area**

The main feature of this MA is Oak Creek Canyon. It adjoins the Pine Belt, Red Rock, and Sedona Neighborwoods MAs and borders Slide Rock State Park. The main road is State Route 89A south, which was formally designated as a scenic road by the Arizona Department of Transportation in 1984. Numerous private land parcels occur within the management area boundary and include residences, commercial enterprises, a fire station, and an Arizona Game and Fish Department fish hatchery.

Major recreation sites are Pine Flat, Cave Springs, Call of the Canyon (West Fork of Oak Creek), Bootlegger, Banjo Bill, Halfway, Manzanita, Encinosa, and Grasshopper Point. Oak Creek Canyon MA is extremely popular for sightseeing, hiking, fishing, and day-use activities. Fall color viewing attracts numerous visitors.

A variety of ecosystems can be found within this MA including riparian, chaparral, forest, and woodlands. Perennial water occurs along Oak Creek and West Fork of Oak Creek, both of which have been designated as Outstanding Arizona Waters.

Despite the perennially flowing Oak Creek, prehistoric activity in the canyon is almost non-existent, other than one or two petroglyph sites, rock shelters, and cave sites.

Historic trails that access the rim of Oak Creek Canyon include Telephone, Purtymun, Harding Springs, Cookstove, Thomas Point, Thompson Ladder, and Casner Trails. The first wagon road in Oak Creek Canyon was built along Oak Creek below Indian Gardens by pioneer Jim Thompson between 1876 and 1887. By 1939, the highway through Oak Creek Canyon was completed to

provide easy transportation for campers, tourists, and fisherman lured by the trout stocked in Oak Creek.

#### **Characteristics of the Oak Creek Canyon Management Area\***

Approximate acres: 6,054 acres of National Forest System land

<b>Wilderness (designated):</b> none	<b>Environmental Study Areas:</b> none
<b>Wilderness (recommended):</b> none	<b>Terrestrial Ecological Response Units:</b>
<b>Wild and Scenic Rivers (designated):</b> none	Interior Chaparral
<b>Wild and Scenic Rivers (eligible):</b>	Pinyon Juniper Evergreen Shrub
Oak Creek (Recreational)	Pinyon Juniper Woodland
West Fork Oak Creek (Wild)	Ponderosa Pine
<b>Inventoried Roadless Areas:</b> none	<b>Riparian Areas:</b> Streams, Wetlands, Springs
<b>National Trails:</b> Wilson Mountain National Recreation Trail	<b>Riparian Forest Types:</b>
<b>Scenic Roads:</b> Oak Creek Canyon Scenic Road	Mixed Broadleaf Deciduous Riparian Forest
<b>Research Natural Areas:</b> Casner Canyon RNA	Montane Willow Riparian Forest
<b>Botanical and Geological Areas:</b> none	<b>Landscape Character Zone:</b> Red Rock
	<b>See also Suitable Uses in Chapter 4</b>

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Oak Creek Canyon Management Area**

MA-OakCrk-DC

- 1 Visitors feel welcomed to Oak Creek Canyon and know where to go to enjoy the activities they seek. Visitor information services emphasize interpretation and orientation to Oak Creek Canyon and Red Rock Country.
- 2 Remains of the historic homesteading activity such as old cabins, irrigation ditches, fruit orchards, wooden water lines, and old roadbeds are present in some locations and contribute to the unique sense of place.
- 3 A network of primarily non-motorized trails provides opportunities at multiple development levels for hikers, and equestrians, while helping protect fragile natural resources and community relationships. Non-motorized trails provide access to the landscape for the community.
- 4 Social encounters in an area, road, or trail are consistent with ROS settings. See FW-Rec-All-DC-4.
- 5 Trails allow for creek access, while protecting riparian areas and associated wildlife, fish, and plant habitats. Creek crossings are limited and hardened by structures or features (such as boulder steps and bridges).

- 6 Developed day-use areas, camping, and dispersed recreation opportunities are present along Oak Creek Canyon.
- 7 Scientific and educational research and educational activities are consistent with resource protection and the recreation setting.
- 8 Development and parking in Oak Creek Canyon emphasize safety and resource protection.
- 9 Interpretive trails are present and provide visitors an understanding of the unique resources within Oak Creek MA.
- 10 Visibility and air quality in Oak Creek Canyon are protected by management of campfires.
- 11 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Standards for Oak Creek Canyon Management Area**

#### **MA-OakCrk-S**

- 1 Commercial plant collection activities shall not be authorized.
- 2 Camping and campfires are prohibited except in designated locations.
- 3 Removal of commercial forest products is by permit at designated locations only.
- 4 Land exchanges that dispose of National Forest System land in the Oak Creek Canyon MA will occur only if they result in acquisition of National Forest System lands in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, or House Mountain-Lowlands MAs.
- 5 Base-for-exchange lands shall be National Forest System lands located at the Slide Rock area (approximately 13 acres, Oak Creek Canyon MA). Base-for-exchange land at the Slide Rock area is intended for Arizona State Parks acquisition.
- 6 Horse and pack stock, except for limited administrative use, are not allowed on the West Fork of Oak Creek Trail.

### **Guidelines for Oak Creek Canyon Management Area**

#### **MA-OakCrk-G**

- 1 A consistent design style should be used for interpretive and informational signs and kiosks, but also allow for individual site distinctiveness in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, and House Mountain-Lowlands MAs.
- 2 Roads should be maintained at the lowest standard possible consistent with safety and the desired recreation experience.
- 3 Roadway features such as signs, guardrails, and landscaping along State Route 89A should be designed to maintain the desired scenic character along the route.
- 4 Road and trail rehabilitation should be focused in steep drainages to reduce sedimentation into Oak Creek Canyon and to mitigate impacts to other forest resources.
- 5 Trails and recreation should be located and managed to reduce impacts to woody riparian vegetation and riparian habitat.

- 6 Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
- 7 Alternative modes of transportation should be encouraged to reduce automobile dependency, traffic congestion, and impacts to air quality.
- 8 Infrastructure and facilities at Oak Creek Vista should be designed to accommodate short-duration visits and/or to emphasize interpretation and orientation to Oak Creek Canyon and Red Rock Country.
- 9 Recreation should be managed to maintain water quality standards by placing toilets in strategic locations, providing information about proper sanitation practices, installing shower and hand-washing facilities, and providing gray water disposal sites.
- 10 Smoke from campfires should be limited or controlled to reduce the impacts of campfire smoke on air quality and to protect habitat for bats, birds, and wildlife.
- 11 Aircraft activities related to commercial filming should be designed to minimize impacts to residential areas and primitive recreational opportunities.
- 12 Mineral material operations should be managed to protect water quality and recreation settings.
- 13 Slide Rock base-for-exchange land should be available for acquisition by Slide Rock State Park to better facilitate management of the creek and park.
- 14 Disposal of National Forest System lands in the Red Rock, Oak Creek Canyon, Sedona Neighborwoods, and House Mountain-Lowlands MAs to resolve encroachment issues or provide lands needed for public purposes should be limited to parcels 10 acres or less to maximize the retention of National Forest System lands in these MAs.
- 15 Pedestrian access to the West Fork of Oak Creek, and the associated facilities, should be consistent with semi-primitive non-motorized ROS class to facilitate transition and entry into the adjacent Red Rock–Secret Mountain Wilderness.

### **Management Approaches for Oak Creek Canyon Management Area**

Work with the Arizona Department of Transportation to reduce unsafe parking adjacent to State Route 89A and to maintain a high standard of [scenic quality](#) in signs.

Encourage the use of native construction materials along State scenic roads to match the natural surrounding environment.

Work with the Arizona Department of Environmental Quality to manage Oak Creek for its Outstanding Arizona Waters status.

Partner with Slide Rock State Park to manage recreation and scenic resources.

Collaborate with land owners and other land managers to educate the public on federally listed and Forest Service sensitive species such as the narrow-headed gartersnake.

Through collaboration with outfitter-guides, develop and provide a commercial guide training program on a regular basis to focus on national forest goals, regulations, Leave No Trace, Tread Lightly, and natural and cultural history.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns.

## **House Mountain-Lowlands Management Area**

### **General Description and Background for House-Mountain Lowlands Management Area**

A major feature in this relatively remote MA is House Mountain. This MA occurs in the west central part of the Coconino NF and north and east of the community of Page Springs. It adjoins Red Rock, Sedona Neighborwoods, and Verde Valley Management Areas.

The main roads are State Route 89A south and State Route 179. There are scattered parcels of private land. Low-density human uses include sightseeing, horseback riding, mountain biking, hiking, firewood cutting, and wildlife-based recreation such as hunting and wildlife viewing, especially for pronghorn. Vegetation within the House Mountain-Lowlands MA include desert, grassland, chaparral, and pinyon juniper.

The area has a moderate archaeological site density that ranges from numerous scatters of flaked stone dating to the Archaic period, about 9,000 B.C. to A.D. 600, through numerous pit house and small pueblos of the Southern Sinagua, to several large pueblos that are contemporaneous with Tuzigoot, dating to A.D. 1300 to 1400. Other lithic scatters are likely related to the Yavapai and Apache.

### **Characteristics of the House Mountain-Lowlands Management Area\***

Approximate acres: 40,901 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):** none

**Inventoried Roadless Areas:** none

**National Trails:** none

**Scenic Roads:** Dry Creek Scenic Road

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

#### **Terrestrial Ecological Response Units:**

Desert Communities

Semi-desert Grassland

Interior Chaparral

Pinyon Juniper Evergreen Shrub

Pinyon Juniper Woodland

#### **Riparian Areas:** Streams, Springs

#### **Riparian Forest Types:**

Mixed Broadleaf Deciduous Riparian Forest

**Landscape Character Zone:** Red Rock

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.



### **Desired Conditions for House Mountain-Lowlands Management Area**

#### MA-HouseMtn-DC

- 1 Low-density human uses are provided in the House Mountain-Lowlands MA. Examples of these uses include scenic viewing, OHV touring, hunting, wildlife viewing, and firewood cutting.
- 2 A network of primarily non-motorized trails provides opportunities at multiple development levels for hikers and equestrians, as well as opportunities for OHV recreationists and mountain bikers outside of wilderness, while helping protect fragile natural resources and community relationships. Non-motorized trails provide access to the landscape for the community.
- 3 Social encounters in an area, road, or trail are consistent with ROS settings. See FW-Rec-All-DC-4.
- 4 There are few roads in the House Mountain-Lowlands MA. Existing roads are primitive, with only native surfacing and no road prism development.
- 5 Facilities are few and the character of these developments appears rustic and primitive.
- 6 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Standards for House Mountain-Lowlands Management Area**

#### MA-HouseMtn-S

- 1 Removal of commercial forest products is by permit at designated locations only.
- 2 Land exchanges that dispose of National Forest System land in the House Mountain-Lowlands MA will occur only if they result in acquisition of National Forest System lands in the Red Rock MA, Sedona Neighborwoods MA, Oak Creek Canyon MA, or House Mountain-Lowlands MA.
- 3 Base-for-exchange lands shall be National Forest System lands located at The Dells area (up to 300 acres, Red Rock MA and House Mountain-Lowlands MA). Land exchanges that dispose of National Forest System land in The Dells area will occur only if they result in acquisition of high-priority private parcels elsewhere in the Red Rock, Oak Creek, House Mountain-Lowlands, and Sedona Neighborwoods MAs. The high-priority land acquisition parcels are Lincoln Canyon (25 acres) and Hancock Ranch (70.3 acres) (see appendix A, map 11).

### **Guidelines for House Mountain-Lowlands Management Area**

#### MA-HouseMtn-G

- 1 A consistent design style should be used for interpretive and informational signs and kiosks, but also allow for individual site distinctiveness in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, and House Mountain-Lowlands MAs.
- 2 Roads should be maintained at the lowest standard possible consistent with safety and the desired recreation experience.

- 3 Roadway features such as signs, guardrails, and landscaping along State Route 89A and State Route 179 should be designed to maintain the desired scenic character along the route.
- 4 Camping and campfire restrictions should be maintained to protect property and unique resources near roadways and neighborhoods and for the Dry Creek Basin and designated special areas.
- 5 Roads should be located to maintain foraging habitat and adequate cover for animal shelter between roads, especially in locations with high road densities.
- 6 Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
- 7 Disposal of National Forest System lands in the Red Rock, Oak Creek Canyon, Sedona Neighborwoods, and House Mountain-Lowlands Management Areas to resolve encroachment issues or provide lands needed for public purposes should be limited to parcels 10 acres or less to maximize the retention of National Forest System lands in these MAs.

#### **Management Approaches for House Mountain-Lowlands Management Area**

Collaborate with motorized outfitter-guides to maintain and protect resources associated with areas, roads, and/or facilities that receive high use by commercial tour activities.

Through collaboration with outfitter-guides, develop and provide a commercial guide training program on a regular basis to focus on national forest goals, regulations, Leave No Trace, Tread Lightly, and natural and cultural history.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns.

#### **Sedona Neighborwoods Management Area**

##### **General Description and Background for Sedona Neighborwoods Management Area**

This somewhat urbanized MA is characterized by a checkerboard of land administered by Coconino NF interspersed with residential and commercial areas. It occurs in the west central part of the Coconino NF, and adjoins the House Mountain-Lowlands, Oak Creek Canyon, and Red Rock Management Areas, as well as Red Rock State Park. The main roads are State Route 89A south and State Route 179. Lands in other ownerships are mainly associated with Sedona and the Village of Oak Creek.

A major feature of the MA is a several-mile stretch of Oak Creek south of Sedona. The boundaries of Red Rock–Secret Mountain Wilderness from Capitol Butte to Steamboat Rock form the MA's northern perimeter.

A variety of ecosystems can be found within the Sedona Neighborwoods MA, including riparian, low-elevation grasslands, chaparral, and pinyon juniper.

This MA is heavily used by visitors and residents who value the easily accessed natural landscape so close to Sedona and the Village of Oak Creek, and who frequently use the honeycomb of trails. Popular activities include hiking, photography, mountain biking, sightseeing, and rock climbing.

The archaeology of the area is similar to that of the House Mountain-Lowlands MA, with evidence of pit house settlements dating back to A.D. 600, as well as artifact scatters and large mounds of burned and fire-cracked rock that represent Yavapai and Apache hunting and gathering activities in the area.

#### **Characteristics of the Sedona Neighborwoods Management Area\***

Approximate acres: 15,125 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):**

Oak Creek (Recreational)

**Inventoried Roadless Areas:** none

**National Trails:** none

**Scenic Roads:** Dry Creek Scenic Road, Oak Creek Canyon Scenic Road, Red Rock All-American Road

**Research Natural Areas:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

**Terrestrial Ecological Response Units:**

Interior Chaparral

Semi-desert Grassland

Pinyon Juniper Evergreen Shrub

Pinyon Juniper Woodland

**Riparian Areas:** Streams, Springs

**Riparian Forest Types:**

Mixed Broadleaf Deciduous Riparian Forest

**Landscape Character Zone:** Red Rock

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

#### **Desired Conditions for Sedona Neighborwoods Management Area**

MA-SedN-DC

- 1 National Forest System lands are easily accessible and provide access to recreational opportunities, while retaining other resource values.
- 2 A network of primarily non-motorized trails provides opportunities at multiple development levels for hikers and equestrians, as well as opportunities for OHV recreationists and mountain bikers outside of wilderness, while helping protect fragile natural resources and community relationships. Non-motorized trails provide access to the landscape for the community.
- 3 Social encounters in an area, road, or trail are consistent with ROS settings. See FW-Rec-All-DC-4.
- 4 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for scenic integrity objectives.

### **Standards for Sedona Neighborwoods Management Area**

#### **MA-SedN-S**

- 1** Commercial plant collection activities shall not be authorized in the Sedona Neighborwoods MA.
- 2** Camping and campfires are prohibited in the Sedona Neighborwoods MA except in designated places.
- 3** Removal of commercial forest products is by permit at designated locations only.
- 4** Land exchanges that dispose of National Forest System land in the Sedona Neighborwoods MA will occur only if they result in acquisition of National Forest System lands in the Red Rock MA, Sedona Neighborwoods MA, Oak Creek Canyon MA, or House Mountain-Lowlands MA.
- 5** Base-for-exchange lands shall be National Forest System lands located at: Chapel of the Holy Cross area (approximately 11 acres, Sedona Neighborwoods MA), Village of Oak Creek Golf Course area (approximately 5 acres, Sedona Neighborwoods MA). Base-for-exchange lands at the Chapel of the Holy Cross area are intended for the church's acquisition only; base-for-exchange lands at Village of Oak Creek Golf Course are intended for golf course acquisition.

### **Guidelines for Sedona Neighborwoods Management Area**

#### **MA-SedN-G**

- 1** A consistent design style should be used for interpretive and informational signs and kiosks, but also allow for individual site distinctiveness in the Red Rock, Sedona Neighborwoods, Oak Creek Canyon, and House Mountain-Lowlands MAs.
- 2** Roads should be maintained at the lowest standard possible consistent with safety and the desired recreation experience. Some forest roads, such as Schnebly Hill Road and Forest Road 152 (near Dry Creek), should be managed for safety and minimum standards to maintain rough conditions, low traffic speeds, and the challenging, narrow character of the roadway.
- 3** Roadway features such as signs, guardrails, and landscaping along State Route 89A and State Route 179 should be designed to maintain the desired scenic character along the route.
- 4** Aircraft activities related to commercial filming should be designed to minimize impacts to residential areas and primitive recreational opportunities.
- 5** Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
- 6** Disposal of National Forest System lands in the Red Rock, Oak Creek Canyon, Sedona Neighborwoods, and House Mountain-Lowlands Management Areas to resolve encroachment issues or provide lands needed for public purposes should be limited to parcels 10 acres or less to maximize the retention of National Forest System lands in these MAs.

### **Management Approaches for Sedona Neighborwoods Management Area**

Engage in strong community partnerships for stewardship of the Sedona Neighborwoods MA to support resident health, safety, and quality of life.

Collaborate with local governments, agencies, and residents to protect resources and address local concerns. To address local concerns, consider a variety of management actions such as nighttime closures, improved signs, and limits on motorized access or number of visitors.

When repairing damaged recreation sites, give priority to sites adjacent to Sedona and the Village of Oak Creek.

Collaborate with the Arizona Game and Fish Department to educate residents about living with urban nuisance wildlife such as deer, snakes, raccoons, skunks, coyotes, and federally listed or Forest Service sensitive species such as the narrow-headed gartersnake.

Work with commercial operators, filming groups, and homeowners to resolve quality of life concerns such as noise, safety, and facilities maintenance.

Through collaboration with outfitter-guides, develop and provide a commercial guide training program on a regular basis to focus on national forest goals, regulations, Leave No Trace, Tread Lightly, and natural and cultural history.

### **Verde Valley Management Area**

#### **General Description and Background for Verde Valley Management Area**

This large MA occurs in the southwestern part of the Coconino NF and to the south and west northwest of Sedona. It adjoins House Mountain-Lowlands, Pine Belt, Red Rock, and Sedona Neighborwoods Management Areas, as well as the Prescott NF along the Verde River and the Tonto NF along its southern boundary. It borders Montezuma Castle National Monument (Montezuma Castle and Montezuma Well) and the Yavapai-Apache Indian Reservation. The main roads are Interstate 17, State Route 89A south, State Route 179, and State Route 260. Lands in other ownership are associated with Sedona. Communities within or adjacent to the Verde Valley Management Area include Page Springs, Cornville, Cottonwood, Lake Montezuma, Rim Rock, McGuireville, and Camp Verde.

The Cottonwood Basin Seasonal Closure Area is on the east side of the Verde River near Cottonwood Basin, south of Wingfield Mesa and west of Forest Road 708, the Fossil Creek Road. See appendix A, map 15. The purpose of the seasonal closure area is to provide seasonally undisturbed habitat for nesting bald eagles.

The MA offers a wide range of motorized and non-motorized dispersed recreation. Visitors and residents who use this MA value the easily accessed natural landscape close to highways and communities. Others value the hard-to-reach canyons and hills away from settlements and highways. Popular activities include scenic touring, camping, swimming, hiking, mountain biking, wildlife-based recreation, and various motorized activities throughout the area. Visitation is generally low to moderate except during the summer in riparian areas.

The Verde Valley and the Verde River are prominent features in this MA. The Mogollon Rim and Mingus Mountain overlook the Verde Valley and the Verde River is the boundary between the Coconino and adjacent national forests.

This MA has some of the most arid and lowest elevation areas on the Coconino NF. It is characterized by open landscapes, expansive views, riparian areas along perennial and intermittent drainages, and rugged topography in many areas. White calcium-rich soils (the Verde Formation) occupy a portion of this MA and support a unique species assemblage. The vegetation is predominantly desert, grassland, chaparral, and pinyon juniper, with riparian forests along stream channels. Perennial waters in this MA include portions of the Verde River, Oak Creek, Wet Beaver Creek, West Clear Creek, and Fossil Creek, which is also designated as an Outstanding Arizona Water.

The Verde Valley has a continuous history of human occupation, beginning with Clovis Paleoindian mammoth hunters of 12,000 years ago. The Verde Valley—including the Sedona Neighborwoods, House Mountain-Lowlands, Munds Mountain, and Sedona-Oak Creek Management Areas—comprised the Southern Sinagua culture area until A.D. 1400, as highlighted by Montezuma Castle, Montezuma Well, and Tuzigoot National Monuments, and the V Bar V Heritage Site of the Coconino NF. Other important sites that date to the 1300s to 1400s on the forest are Sacred Mountain and Clear Creek Ruins, both of which are listed on the National Register of Historic Places. About A.D. 1250, the Northeastern Yavapai entered the Verde Valley, and later, the Tonto Apache. Both groups continue to live in the Verde Valley as the Yavapai-Apache Nation. Euro-American miners, farmers, and ranchers spread into the Verde Valley starting in the 1860s, and several of those pioneering families still live in the Camp Verde and Sedona areas. Fort Verde State Park; the towns of Camp Verde, Cottonwood, and Clarkdale; General Crook Trail; the Chavez/Palatkwapi Trail; 13 Mile Rock; and scattered ranches represent the historic period growth of the Verde Valley. At Beaverhead, where the Chavez Road comes down from the steep Mogollon Rim, there is an historic marker that recognizes the former location of the Beaverhead Stage Stop that was active in the late 1800s. It was also the location of the Beaverhead Ranger Station, which counted and monitored the movement of stock that used the road to move to summertime grazing areas on top of the Mogollon Rim.

During the 1930s, there were Civilian Conservation Corps work camps at both the Beaver Creek and Clear Creek Ranger Stations. Cement pads where the bunkhouses were located are still visible at Clear Creek Camp Ground. The Beaver Creek Ranger Station is listed on the National Register of Historic Places as an outstanding example of a 1930s Forest Service administrative site.

**Characteristics of the Verde Valley Management Area\***

Approximate acres: 323,455 acres of National Forest System land

**Wilderness (designated):**

Fossil Springs Wilderness  
 Mazatzal Wilderness  
 Sycamore Canyon Wilderness  
 West Clear Creek Wilderness  
 Wet Beaver Wilderness

**Wilderness (recommended)**

Davey's Wilderness - Recommended

**Wild and Scenic Rivers (designated):**

Verde River (Scenic, Wild)

**Wild and Scenic Rivers (eligible):**

Fossil Creek (Recreational, Wild)  
 Sycamore Creek (Wild)  
 Verde River (Recreational)  
 West Clear Creek (Wild, Scenic)  
 Wet Beaver Creek (Recreational, Wild)

**Inventoried Roadless Areas:** Boulder Canyon, Cimarron Hills, Hackberry, Walker Mountain

**National Trails:** General George Crook National Recreation Trail

**Scenic Roads:** none

**Research Natural Areas:**

West Clear Creek RNA (proposed)

**Botanical and Geological Areas:**

Verde Valley Botanical Area  
 Fossil Springs Botanical Area  
 Cottonwood Basin Geological and Botanical Area

**Environmental Study Areas:** none**Terrestrial Ecological Response Units:**

Desert Communities  
 Interior Chaparral  
 Semi-desert Grassland  
 Pinyon Juniper Evergreen Shrub  
 Pinyon Juniper Woodland  
 Ponderosa Pine

**Riparian Areas:** Streams, Wetlands, Springs

**Riparian Forest Types:**

Cottonwood Willow Riparian Forest  
 Mixed Broadleaf Deciduous Riparian Forest  
 Montane Willow Riparian Forest

**Landscape Character Zone:** Verde Valley

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

**Desired Conditions for Verde Valley Management Area**

MA-VerdeV-DC

- 1 Watersheds are managed to reduce the risk of uncharacteristic flooding and sedimentation into downstream communities, perennial streams and their tributaries, wildernesses, and other special areas. This would include watersheds that affect drainages such as Beaver Creek, Dry Beaver Creek, Red Tank Draw, Russell Wash, Walker Creek, West Clear Creek, and Oak Creek.

- 2 National Forest System lands are easily accessible and provide access to recreational opportunities on and off the forest. There are numerous locations for people to escape into natural, wild places.
- 3 An interconnected trail system, accessible through strategically located trailheads and connector trails, provides motorized and non-motorized recreation in the Verde Valley Management Area. The National Forest System trail system connects to State, county, and community trail systems to provide access to recreation opportunities.
- 4 Areas used for dispersed recreation retain their natural character to the extent possible, while maintaining or moving toward other desired conditions. These areas have little evidence of human waste and litter, and emphasize resource protection.
- 5 The prehistoric, historic, and settlement history of the Verde Valley is an integrated part of interpretive programs throughout the area. The relationship between the landscape of the Forest and nearby national monuments is highlighted.
- 6 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.
- 7 Cottonwood Basin Seasonal Closure Area provides seasonally undisturbed habitat to protect rare wildlife.

#### **Standards for Verde Valley Management Area**

##### **MA-VerdeV-S**

- 1 The Ladders Bald Eagle Breeding Closure Area shall be closed to motor vehicle use from December 1 to June 15 for wildlife habitat purposes and to protect rare wildlife. This closure also prohibits watercraft from landing, using the beach, or delaying passage within the closure area during this time frame.

#### **Guidelines for Verde Valley Management Area**

##### **MA-VerdeV-G**

- 1 Projects and activities should be designed and implemented to maintain or improve watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species.
- 2 Recreation should be managed to reduce user conflicts, to maintain the desired conditions of other resources, and/or to promote public health and safety.
- 3 Motorized trails and trail systems should be designed to move users away from residential areas and to reduce conflicts between motorized users and neighboring lands.

#### **Management Approaches for Verde Valley Management Area**

Collaborate with organizations and groups such as Arizona State Parks (including the Arizona State Park Off-Highway Vehicle Program, Yavapai County, local organizations and groups, such as the Beaver Creek Trails Coalition, Beaver Creek Kiwanis Club, and the Montezuma Homeowners Association, during non-motorized and motorized trail and trailhead planning and construction efforts.



Work with stakeholders to develop collaborative solutions to problems that arise from high-use recreation.

Collaborate with the Montezuma Castle National Monument staff to better meet visitor needs and protect resources in the vicinity of Montezuma Castle and Montezuma Well.

Collaborate with Arizona State Parks to better meet visitor needs and protect resources in the vicinity of Deadhorse State Park.

## **Long Valley Management Area**

### **General Description and Background for Long Valley Management Area**

This MA occurs in the south portion of Coconino NF and adjoins Anderson Mesa, C.C. Cragin Watersheds, East Clear Creek, and Pine Belt Management Areas.

Main roads are Forest Highway 3 and State Highway 87.

Long Valley MA vegetation is predominantly ponderosa pine, but also includes grasslands, riparian, pinyon juniper, mixed conifer, and wetlands.

This MA is most heavily used on weekends and holidays for dispersed camping, hiking, and motorized recreation. Unique features include: Stoneman Lake, the Discovery Channel Telescope; several fire lookouts, the Long Valley Experimental Forest, and the upper end of the West Clear Creek Wilderness. Private land is mainly associated with Stoneman Lake and in grasslands along Forest Highway 3.

Commercial businesses in the area provide visitors a hub for staging, resupplying, and gathering information about the forest, which supports camping and other kinds of dispersed recreation throughout the management area.

Evidence for prehistoric use of the Long Valley MA is sparse and the area is characterized by a very low archaeological site density. As with other areas at higher elevation in the ponderosa zone on the forest, poor soils and cold temperatures were not conducive to settlement by prehistoric agriculturalists. In historic times, the Long Valley MA was the scene of numerous skirmishes during the Apache Wars of the 1860s to 1880s, and a passageway for many pioneering families who settled central Arizona in the latter part of the 19th and early 20th centuries. The General George Crook Road, from Fort Apache to Fort Whipple in Prescott, crosses the lower part of this MA and is mostly followed by the Rim Road. It is a National Recreation Trail and is under study for nomination as a [National Historic Trail](#).

### Characteristics of the Long Valley Management Area\*

Approximate acres: 164,055 acres of National Forest System land

**Wilderness (designated):**

West Clear Creek Wilderness

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):**

Barbershop Canyon (Wild)

East Clear Creek (Scenic)

West Clear Creek (Wild)

**Inventoried Roadless Areas:**

East Clear Creek

**National Trails:** Arizona National Scenic Trail, General George Crook National Recreation Trail

**Scenic Roads:** none

**Research Natural Areas:** Rocky Gulch RNA (proposed)

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

**Terrestrial Ecological Response Units:**

Great Basin Grassland

Montane/Subalpine Grassland

Pinyon Juniper Evergreen Shrub

Pinyon Juniper Woodland

Ponderosa Pine

Mixed Conifer Frequent Fire

Mixed Conifer with Infrequent Fire

**Riparian Areas:** Wetlands, Springs, Streams

**Riparian Forest Types:**

Mixed Broadleaf Deciduous Forest

Montane Willow Riparian Forest

**Landscapes Character Zone:** Ponderosa Pine

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### Desired Conditions for Long Valley Management Area

MA-LongV-DC

- 1 Long Valley MA provides a mix of well-preserved, semiprimitive opportunities interspersed with rural or roaded natural settings.
- 2 Long Valley MA provides opportunities for motorized dispersed camping and associated recreation uses.
- 3 Dispersed camping corridors are common along maintained roads that connect to highways and Forest Road 300.
- 4 Campgrounds and rental cabins provide developed recreation opportunities in settings that are mostly natural-appearing, but may have moderate evidence of human activity.
- 5 The ridges and canyons in Long Valley MA provide solitude and more primitive non-motorized recreation opportunities than surrounding areas. These areas also provide low-disturbance wildlife habitat.
- 6 Functioning wetlands provide nesting and migratory habitat for waterfowl and shorebirds; foraging habitat for peregrine falcons and other raptors; and water for a variety of species.
- 7 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Guidelines for Long Valley Management Area**

#### **MA-LongV-G**

- 1 Dispersed camping opportunities and motorized recreation should be managed to occur outside the vicinity of meadows and riparian areas to maintain soil function, long-term soil productivity, and desired conditions for associated resources.

### **Management Approaches for Long Valley Management Area**

Coordinate with local commercial businesses to disperse information to the local public and forest visitors.

Inventory and evaluate dispersed sites for future management options to meet the needs for dispersed recreation opportunities in Long Valley MA.

### **East Clear Creek Management Area**

#### **General Description and Background for East Clear Creek Management Area**

This relatively remote MA is located in the southeast portion of Coconino NF and adjoins Anderson Mesa, C. C. Cragin Watersheds, Long Valley, and Pine Belt Management Areas. This MA is not accessed by main highways, but rather by several forest roads including Forest Road 300 along the Mogollon Rim, which provides views into the adjoining Tonto NF and Apache-Sitgreaves NFs. It is characterized by East Clear Creek flowing along its northern boundary; Leonard Canyon on the eastern perimeter; and Forest Road 300 along its southern boundary. Archaeological site density is very low and consists mostly of small scatters of flaked stone that likely represent hunting camps during the Archaic and Sinagua, times. The Mogollon Rim is part of the traditional homeland of the Western Apache.

Vegetation is predominantly ponderosa pine and mixed conifer with scattered pinyon juniper, high-elevation grasslands, riparian, and wetlands. This MA contains main tributaries to and portions of East Clear Creek, which are key habitat for the Little Colorado spinedace, an endemic and federally threatened fish. It also contains the headwaters and tributaries of Leonard Canyon, a perennial stream and eligible wild and scenic river segment shared with the Apache-Sitgreaves NFs. Other key features are the numerous cool moist drainages separated by drier forested ridges. These provide mostly undisturbed habitat for a variety of forest dwelling species, and solitude and quiet for people.

This MA has a developed campground at Knoll Lake. The few parcels of private land are mainly in the north portion of the MA.

### Characteristics of the East Clear Creek Management Area\*

Approximate acres: 53,124 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):**  
none

**Wild and Scenic Rivers (eligible):**

Barbershop Canyon (Wild)

East Clear Creek (Scenic)

Leonard Canyon (Recreational)

**Inventoried Roadless Areas:** Barbershop  
Canyon, East Clear Creek

**National Trails:** General George Crook  
National Recreation Trail

**Scenic Roads:** none

**Botanical and Geological Areas:** none

**Environmental Study Areas:** none

**Research Natural Areas:** none

**Terrestrial Ecological Response Units:**

Montane/Subalpine Grassland

Pinyon Juniper Woodland

Ponderosa Pine

Mixed Conifer Frequent Fire

**Riparian Areas:** Wetlands, Springs,  
Streams

**Riparian Forest Types:**

Montane Willow Riparian Forest

**Landscape Character Zone:** East Clear  
Creek

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### Desired Conditions for East Clear Creek Management Area

MA-EastClr-DC

- 1 East Clear Creek MA provides mainly semiprimitive recreational opportunities. The environment is predominantly natural-appearing with little evidence of resource modification and there are opportunities for self-reliance, challenge, and solitude.
- 2 The canyons in this MA provide solitude and more primitive non-motorized recreational opportunities than surrounding areas. These areas also provide low-disturbance for wildlife habitat and non-motorized recreation, except along designated roads.
- 3 The Knoll Lake area provides developed campground opportunities in a setting that is mostly natural-appearing, but may have moderate evidence of human activity.
- 4 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### Guidelines for East Clear Creek Management Area

MA-EastClr-G

- 1 Dispersed camping opportunities and motorized recreation should be managed to occur outside the vicinity of meadows and riparian areas to prevent negative resource impacts.

## C.C. Cragin Watersheds Management Area

### General Description and Background for C.C. Cragin Watersheds Management Area

C.C. Cragin MA occurs in the southeastern portion of the Coconino NF and adjoins the East Clear Creek and Long Valley Management Areas, as well as Tonto NF. It is accessed by forest roads that join Highway 87 and is characterized by C.C. Cragin Reservoir and Forest Road 300 along the Mogollon Rim.

Predominant vegetation is ponderosa pine and mixed conifer with scatter pockets of riparian, grasslands, and wetlands. Numerous cool moist drainages are separated by drier forested ridges providing undisturbed habitat for forest dwelling species, and solitude and quiet for people.

C.C. Cragin supplies water via a pipeline for the Town of Payson and other communities in northern Gila County. The 6th code watersheds that support the C.C. Cragin Reservoir are: Bear Canyon, Miller Canyon, and East Clear-Blue Ridge. C.C. Cragin reservoir also provides water-based recreation. There are several campgrounds in the MA and the Arizona National Scenic Trail crosses this management area.

The MA also contains the General Springs Cabin at General Springs, a well-known water on the General George Crook Trail, and three historical markers that commemorate the Battle of Big Dry Wash. It was the last formally designated battle of the Apache Wars with the United States in 1882. Several historic period cabins have also been recorded with this Management Area.

### Characteristics of the C.C. Cragin Watersheds Management Area\*

Approximate acres: 45,711 acres of National Forest System land

**Wilderness (designated):** none

**Wilderness (recommended):** none

**Wild and Scenic Rivers (designated):** none

**Wild and Scenic Rivers (eligible):**

East Clear Creek (Scenic)

**Inventoried Roadless Areas:** none

**National Trails:** Arizona National Scenic Trail,  
General George Crook National Recreation  
Trail

**Scenic Roads:** none

**Research Natural Areas:** none

**Botanical and Geological Areas:**

Mogollon Rim Botanical Area

**Environmental Study Areas:** none

**Terrestrial Ecological Response Units:**

Montane/Subalpine Grassland

Ponderosa Pine

Mixed Conifer Frequent Fire

**Riparian Areas:** Wetlands, Springs, Streams

**Riparian Forest Types:**

Cottonwood Willow Riparian Forest

Montane Willow Riparian Forest

**Landscape Character Zone:** East Clear Creek

**See also Suitable Uses in Chapter 4**

\*ERUs and riparian forest types were generated using forest-level data and need to be validated at the project level.

### **Desired Conditions for C.C. Cragin Watersheds Management Area**

#### **MA-CCCrg-DC**

- 1 There is low risk of substantial damage from uncharacteristic fire and recreation to water supply, infrastructure, water quality, visual quality, and cultural integrity (such as tribes and local communities).
- 2 The canyons in this MA provide solitude and more primitive non-motorized recreation opportunities than surrounding areas. These areas also provide low-disturbance wildlife habitat.
- 3 For scenery desired conditions, see the forestwide section on Scenic Resources and map 13 for SIOs.

### **Guidelines for C.C. Cragin Watersheds Management Area**

#### **MA-CCCrg-G**

- 1 The C.C. Cragin Watersheds MA should be managed to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity.
- 2 Roads and trails within the C.C. Cragin Watersheds MA should be maintained to prevent erosion and sedimentation and to protect existing infrastructure.

### **Management Approaches for C.C. Cragin Watersheds Management Area**

Coordinate with the Salt River Project, National Forest Foundation, Town of Payson, the Bureau of Reclamation, U.S. Fish and Wildlife Service, Arizona Game and Fish Department, Arizona Elk Society, the local community, and other stakeholders to proactively improve the health and resiliency of the C.C. Cragin Watersheds Management Area.

## **Special Areas**

### **Designated Wilderness Areas**

See appendix A, map 3.

### **General Description and Background for Designated Wilderness Areas**

There are 10 existing wilderness areas on the Coconino NF. This plan provides direction for eight of them. Direction for the remaining two, Kendrick Mountain and Mazatzal Wilderness Areas, is provided in the Kaibab and Tonto NFs' plans, respectively. This ensures consistent management of these wilderness areas across forest boundaries. The Coconino NF's plan contains direction for Sycamore Canyon Wilderness, which also lies within the Prescott and Kaibab NFs.

#### **Fossil Springs Wilderness**

Fossil Springs Wilderness is a 10,431-acre rugged canyon with tributaries that connect to Fossil Creek, a major tributary of the Verde River. It is on the southern boundary of the Coconino NF and adjoins the Tonto NF. Popular Fossil Creek is easily accessed in some places, but is largely outside of the wilderness. Many portions of the Fossil Springs Wilderness are rugged, remote, and difficult to access.

Elevations vary from 4,000 to 6,849 feet. Semi-desert grassland and pinyon juniper vegetation gives way to ponderosa pine in the uplands. A number of springs support riparian vegetation. The Fossil Springs Wilderness is dominated by late Paleozoic sedimentary rocks underlying basalt flows. Collectively, the diversity of vegetation and topography plus water provides habitat for a wide variety of species.

Historical features in the Fossil Springs Wilderness include the Mail Trail, once used for horseback mail delivery, and a portion of the Flume Trail, associated with the historic Childs-Irving hydroelectric powerplant. Fossil Springs Wilderness is noted for its high archaeological site density, evidence of prehistoric agriculture, and use by the Singua and historic and modern-day Apaches.

#### **Kachina Peaks Wilderness**

The Kachina Peaks Wilderness is an 18,705-acre area that includes the San Francisco Peaks, a heavily vegetated composite volcano. The wilderness ranges in elevation from 7,760 to 12,622 feet and includes Humphreys Peak, the highest point in Arizona. The San Francisco Peaks are an outstanding example of past volcanic activity and preserve good examples of Ice Age glaciation in Arizona.

Kachina Peaks Wilderness supports the only alpine tundra, bristlecone pine, corkbark fir, spruce fir, and subalpine grassland vegetation on the Coconino NF. This is the only alpine tundra on National Forest System lands in Arizona and one of the few locations for bristlecone pine and spruce fir. The vegetation transitions into mixed conifer forest and ponderosa pine at lower elevations. These high-elevation vegetation communities provide habitat for an assemblage of species not found elsewhere on the forest, as well as habitat for a variety of other species. Alpine tundra supports a federally threatened plant, the San Francisco Peaks ragwort, as well as other endemic plant species.

The San Francisco Peaks are sacred to a number of southwestern tribes, most notably the Hopi and Navajo, but also the Yavapai, Walapai, Havasupai, Apache, Zuni, and Acoma.

The Kachina Peaks Wilderness is very popular for hiking, backcountry winter sport activities, and wildlife-related recreation, as well as for scenery and viewing the changing colors of aspen. Trails to the top of peaks within the wilderness have higher use than is typical of more remote wilderness.

This wilderness contains the San Francisco Peaks Research Natural Area, which provides a control or reference for an alpine tundra ecosystem at the southern extent of this ecosystem's range.

#### **Kendrick Mountain Wilderness**

Kendrick Mountain Wilderness is 6,659-acre area that encompasses Kendrick Peak. In 2000, most of the wilderness was burned in a large wildfire. Fire intensities ranged from light to very severe, with more intensely burned areas located on the west, north, and east slopes of the peak. Mixed conifer forests occur in the unburned and lightly burned areas. Natural recovery processes are occurring in more intensely burned areas, with aspen and other early seral species becoming established in those sites. Unstable volcanic soils have undergone severe erosion on the steeper slopes within the burned area. About 2,449 acres of the wilderness are within the Coconino NF

administrative boundary. The remaining acres are on the Kaibab NF. The entire Kendrick Mountain Wilderness is managed under the Kaibab NF Forest Plan.

#### **Mazatzal Wilderness**

Mazatzal Wilderness is a 249,964-acre area that mostly occurs on the Tonto NF. About 2,591 acres of the wilderness are within the Coconino NF administrative boundary. The entire Mazatzal Wilderness is managed under the Tonto NF Forest Plan.

#### **Munds Mountain Wilderness**

The rugged Munds Mountain Wilderness is an 18,093-acre area east of Sedona. There are extensive outcroppings of Coconino and Supai sandstone on the cliff faces of Munds and Lee Mountains underlying the most recent basalt flows. Elevations range from 3,980 to 6,850 feet. Rattlesnake, Woods, and Upper Jacks Canyon are the major drainages.

Semi-desert grassland, chaparral, and oak vegetation blend with pinyon juniper, depending on slope and aspect. There are scattered pockets of ponderosa pine and native Arizona cypress trees. Upper Woods Canyon and the other major drainages support riparian vegetation. This diversity of structure, vegetation, slope, and aspect creates habitat for a wide variety of species.

Munds Mountain Wilderness is noted for its high archaeological site density by the prehistoric Southern Sinagua. Sites include artifact scatters, representing hunting and gathering activities; small pit house sites; agricultural fields; and field houses. However, the most prominent site type in the area consists of pueblos located on the edges of the canyons that cut through the area. These have typically been considered forts, indicating a time of conflict near the end of the prehistoric period. However, since none of these “forts” have been scientifically excavated, this interpretation is still an active topic of modern archaeology.

#### **Red Rock–Secret Mountain Wilderness**

The Red Rock–Secret Mountain Wilderness is a 48,097-acre area that plunges into canyons that drain into Oak Creek and the Verde River. Secret Mountain and Wilson Mountain are high mesas that jut into the lower country. Elevations range from 4,500 to 7,190 feet. This popular wilderness is adjacent to Sedona and within an hour of Flagstaff. There are numerous trail heads leading into this wilderness as well as air tours, and guided motorized tours on the periphery. The trail at the eastern end of the West Fork of Oak Creek has higher traffic than is typical of more remote wilderness.

Ponderosa pine and mixed conifer vegetation grows at higher elevations and cooler sites, while pinyon juniper, chaparral, and low-elevation grasslands occupy arid warmer locations. Riparian vegetation occurs in cool moist drainages and native Arizona cypress trees are found in small scattered populations. Several basalt lava flows cap the high cliffs of older sedimentary rock formations. The diverse vegetation and microclimates created by this rugged wilderness support a wide variety of species.

The Oak Creek Canyon Research Natural Area is in the Red Rock–Secret Mountain Wilderness.

Red Rock–Secret Mountain Wilderness was most heavily occupied in prehistoric times by the Southern Sinagua during the A.D. 1150 to 1300 period. Cliff dwellings are the most notable site types, forming single-family homes, as well as storage facilities for crops grown on the mesa tops and canyon bottoms.



### **Strawberry Crater Wilderness**

The 10,404-acre Strawberry Crater Wilderness consists of pinyon juniper hills, cinder terrain, and lava fields, and is characterized by the 50,000- to 100,000-year-old Strawberry Crater. The jagged features and deep rust color of Strawberry Crater make it unique among other cinder cones in the San Francisco Peaks volcanic field. The crater was formed by slow-moving basaltic andesite. The ridges of the central crater show the distinct layering that occurred during eruption.

Elevations range from 5,300 to 6,652 feet. The cinder soils support pinyon juniper and Great Basin grassland vegetation along with endemic species such as Sunset Crater beardtongue (*Penstemon clutei*). There are a few game animals and small mammals throughout.

Strawberry Crater Wilderness was occupied by the northern Sinagua and is also an important place to the Hopi and Navajo.

Motor vehicle intrusion into the wilderness is an issue because it is near the Cinder Hills OHV Area, has relatively open terrain, and has roads along the wilderness perimeter.

### **Sycamore Canyon Wilderness**

This 21-mile-long scenic canyon reaches a maximum width of about 7 miles. Elevation ranges from 3,582 to 7,256 feet. Sycamore Canyon Wilderness is 58,516 acres, of which 23,971 are on the Coconino NF. It is a designated Class I Airshed. This wilderness is located on the Coconino, Kaibab, and Prescott NFs. The management direction for the Sycamore Canyon Wilderness is contained in the Coconino NF Land and Resource Management Plan.

The southern portion of the area is a series of broad mesas. Gently sloping drainages connect to the Verde River and its extensive riparian habitat. The northern section is a series of foothills and canyons that rise to a 300-foot rim of rugged sandstone outcrops along Sycamore Canyon. Desert, chaparral, semi-desert grassland and pinyon juniper vegetation in the lower elevations transition into ponderosa pine, mixed conifer, and montane grasslands in the higher areas. Riparian vegetation is tied to perennial water and springs. Flooding from precipitation events remains an important ecological process in Sycamore Creek. The wide variety of wildlife reflects the array of vegetation and landforms associated with the Sycamore Creek Wilderness.

Sycamore Canyon has long been noted for its cliff dwellings, as well as tall tales of lost Spanish gold mines and Mexican treasure hunters ambushed by Apaches.

### **West Clear Creek Wilderness**

The 15,459-acre West Clear Creek Wilderness is located 10 miles east of Camp Verde. Its main features are West Clear Creek, a main tributary of the Verde River, and its rugged canyon and tributaries.

Elevations range from 3,469 to 7,017 feet. The canyon is narrow for most of its length, with numerous side canyons. Diverse vegetation reflects the complex topography. Ponderosa pine and mixed conifer tree species populate moist cool sites, while pinyon juniper, chaparral, and grasslands occupy more arid sites. A variety of riparian vegetation is associated with perennial water and springs. The formations visible in the wilderness are, from bottom to top, Late Paleozoic sedimentary rocks (Supai, Coconino, and Kaibab formations), Tertiary sediments, and Tertiary basalt lava flows. The wide variety of vegetation and topography supports numerous wildlife species.

Evidence of Sinagua occupation is prominent in the vicinity of perennial streams and canyons such as West Clear Creek and nearby Wet Beaver Creek, as well as in the Verde Valley.

### **Wet Beaver Wilderness**

Wet Beaver Wilderness is a 6,173-acre area characterized by Wet Beaver Creek and its canyon and tributaries. The popular and easily accessed western end of the wilderness opens toward the Verde Valley and includes the canyon rim and some of the adjacent plateau. Access is more primitive and limited to the steep-walled and rugged eastern end of the wilderness. Elevations range from 4,000 to 6,386 feet.

Riparian vegetation lines the terraces of Wet Beaver Creek in most places and occurs around springs. Wet Beaver Creek is perennial and a major tributary of the Verde River. Ponderosa pine occurs in scattered cool locations in the Wet Beaver Wilderness, whereas pinyon juniper and semi-desert grasslands dominate more arid sites. More recent Tertiary volcanic rocks overlie older Paleozoic limestone and sandstone, which is highly fractured in places. The combination of vegetation, topography, and perennial water supports a variety of habitats for many wildlife species.

Just outside the northern edge of the wilderness is the ancient Palatkwabi Trail. It is likely that a side trail from Palatkwabi Trail entered the Verde Valley and was a major trade connection between the southern Sinagua of the Verde Valley and the early Hopi pueblos along the Little Colorado River and the Hopi mesas to the north. Consequently, evidence of Sinagua occupation, such as petroglyphs, is prominent in the general vicinity at nearby V – V Ranch Heritage Site as well as in parts of the wilderness.

### **Desired Conditions for Designated Wilderness Areas**

#### **SA-Wild-DC**

- 1** Wilderness areas retain their primitive integrity and provide their full range of social and ecological values.
- 2** Ecosystems and ecological resources within wilderness are functioning properly and reflect natural processes. Unique features are preserved, such as the scarp of the Mogollon Rim and the travertine in the Fossil Springs Wilderness Area, and hanging gardens in the West Clear Creek Wilderness Area.
- 3** Topography and an array of ecosystems and elevations collectively provide for a variety of habitats that support species diversity. A natural assemblage of native species that are indigenous to the wilderness area is present and supported by properly functioning habitat conditions.
- 4** Disturbances, including fire and flooding, are able to play their natural role within the wilderness area while accounting for public health and safety concerns outside of the wilderness area.
- 5** The tribal and cultural importance of the San Francisco Peaks within the Kachina Peaks Wilderness are acknowledged and valued.
- 6** Effectively managed boundaries result in wilderness areas free of motorized and mechanized intrusions.

- 7 Wilderness-dependent opportunities and activities are consistent with resource values and the desired [wilderness opportunity spectrum](#) settings.
- 8 Desired wilderness opportunity spectrum settings are maintained. In high-use locations (such as front country areas and along high-use trails), inconsistencies such as group size, social encounters, sense of solitude, and level of signage may be present, but do not detract from the overall wilderness character. High-use areas include Boynton Canyon, Bell Rock, West Fork, Humphrey's Trail, places near private land, and near the Arizona Snowbowl.
- 9 Educational materials and interpretation encourage widespread and common understanding of and support for wilderness values, philosophy, resources, and benefits. Consequently, residents and visitors not only appreciate and learn about wilderness, but understand their role in protecting ecological systems and wilderness values. This results in increased forest stewardship, ecological awareness, partnerships, and volunteerism.
- 10 Visitors learn about wilderness and associated prehistoric, historical, and ecological resources at wilderness gateways and nearby high-traffic roadside facilities.
- 11 Special use permits authorizing activities in wilderness facilitate protection, education, and/or the enjoyment of the wilderness character. These permitted activities maintain the challenging and self-reliant experience of other wilderness visitors and do not cause widespread negative impacts to wilderness character.

### **Objectives for Designated Wilderness Areas**

#### **SA-Wild-O**

- 1 Annually, rehabilitate one to five wilderness sites or areas that have been impacted by recreation in order to restore wilderness character.
- 2 Develop and implement management plans for any newly designated wilderness areas within 5 years after designation occurs, if required by the designating legislation.

### **Standards for Designated Wilderness Areas**

#### **SA-Wild-S**

- 1 In wilderness, group size limit is 12 persons and stock animals (combined).
- 2 Commercial and organizational group activities shall be permitted only for activities that promote wilderness values.
- 3 In the Kachina Peaks Wilderness in the Alpine Tundra ERU, recreational activities shall only occur on designated trails during snow-free periods. Off-trail travel may occur when there is enough snowpack to protect underlying vegetation.
- 4 In the Kachina Peaks Wilderness above treeline in the Alpine Tundra ERU, overnight camping and recreational livestock use such as horses, pack stock, mules, or llamas shall be prohibited.
- 5 In the Kachina Peaks Wilderness, new route construction shall avoid important habitat for the San Francisco Peaks ragwort, such as designated critical habitat, occupied habitat, and high density of plants.

### **Guidelines for All Designated Wilderness Areas**

#### **SA-Wild-G**

- 1** Management activities and permitted uses should be designed to maintain or move toward the desired conditions for wilderness and other resources.
- 2** Use levels should be managed through permit systems or other methods to prevent wilderness values and opportunities from being compromised.
- 3** In order to maintain visitor experiences consistent with desired wilderness opportunity spectrum settings (such as solitude), large group activities should not occur in wilderness.
- 4** Projects and management activities should be designed to prevent bicycle access into adjacent wilderness areas.
- 5** Wilderness interpretation should emphasize topics such as group size limitations, mechanized transport limitations, importance of self-reliance, and sensitive ecological features, to help preserve wilderness opportunities and character.
- 6** To maintain wilderness character, signs or cairns should be restricted to those necessary for resource protection and user safety.
- 7** Signs and parking for wilderness access should be designed and located to concentrate parking and visitor information in designated areas. Casual wilderness use resulting from roadside parking should be discouraged to prevent the development of social trails.
- 8** In the Fossil Creek Wilderness, projects and activities should be designed to maintain the travertine formations and water chemistry of Fossil Creek.
- 9** In the Kachina Peaks Wilderness, trails and signs should be managed to discourage and reduce off-trail travel to protect alpine tundra vegetation.
- 10** In the Strawberry Crater Wilderness Area, barriers and signs along the wilderness boundary should be designed to prevent motor vehicle intrusions.
- 11** In the Sycamore Canyon Wilderness Area, springs and historic cabins should be protected from recreation impacts to maintain their ecological and cultural values and their contributions to wilderness character.

### **Management Approaches for Designated Wilderness Areas**

Closely monitor wilderness areas for overuse and unacceptable resource damage to identify when onsite management is needed.

Use levels may be determined by limits of acceptable change studies, range analyses, code-a-site inventories, or professional judgment.

Survey and sign wilderness boundaries as soon as practicable. Prioritize surveying and signing of areas where land management activities are proposed adjacent to wilderness.

Manage bicycle intrusions into wilderness areas through methods such as ranger patrols, placement of bike racks near wilderness boundaries, signs, trail design, and expanded opportunities outside of the wilderness.

Collaborate with the Federal Aviation Administration, airport administrations, air tour operators, military and government agencies, and other aircraft operators to minimize disturbances caused by aircraft over designated wilderness areas of the Coconino NF. Aircraft disturbances include, but are not limited to, diminishing solitude and primitive recreation opportunities and disruption to key wildlife areas during important times of their life cycle. Examples could include peregrine falcon nesting sites and big game wintering habitat. Encourage aircraft operators to adhere to the Federal Aviation Administration's Notice to Airmen regarding minimum altitudes over wilderness.

Coordinate regular wilderness stewardship patrols to provide interpretation and onsite management to preserve wilderness opportunities. Consider using volunteers to assist with patrols.

Collaborate with stakeholders and programs such as the Wilderness Information Specialist program to build a volunteer base for wilderness management.

Expand partnerships to increase awareness of wilderness values and etiquette. Provide residents who live near wilderness with information that will increase their awareness and understanding of wilderness.

Coordinate law enforcement activities with wilderness managers to ensure that any evidence of illegal activities is removed.

Coordinate with the Arizona Game and Fish Department on management of native species within wilderness per the current memorandum of understanding.

## **Recommended Wilderness**

See appendix A, map 3.

### **General Description and Background for Recommended Wilderness**

The three recommended wilderness areas—Abineau (addition to the Kachina Peaks Wilderness), Strawberry Crater (addition to the Strawberry Crater Wilderness), and Davey's (addition to Fossil Springs Wilderness) will use the interim direction provided below until they are considered for designation by Congress. If an area is designated by Congress, the direction in this section no longer applies and the area is managed according to the Wilderness Act, agency policy, and direction for designated wilderness in the previous section of the plan.

#### **Abineau Recommended Wilderness**

Abineau Recommended Wilderness is a 415-acre area located on an alluvial fan on the north side of the San Francisco Peaks. If designated, it would be an addition to the Kachina Peaks Wilderness, which lies to the south. It adjoins Forest Road 418 to the north, and private land to the west.

Elevation ranges from 8,200 to 8,849 feet. Its hilly topography supports mixed conifer, aspen, and ponderosa pine vegetation and it provides habitat for species typically associated with this vegetation. The Abineau Recommended Wilderness is accessed by Abineau Trail and Bearjaw Trail, which are popular hiking trails during the summer and fall.

Evidence of human use of the recommended Abineau Wilderness Area is very sparse due to its topography and high elevations. It is considered very low in archaeological site density, with no potential for agriculture and limited potential for hunting and gathering. Only one prehistoric site, consisting of a few one-room structures, is known. However, as part of the San Francisco Peaks (an area considered sacred by many southwestern tribes), it is managed as a high-value heritage resource.

#### **Strawberry Crater Recommended Wilderness**

Strawberry Crater Recommended Wilderness is a 6,579-acre area that, if designated, would be an addition to the existing Strawberry Crater Wilderness. It is located in the northeastern part of the Coconino NF not far from Wupatki National Monument and Sunset Crater Volcano National Monument. Access is from Forest Road 545 (Sunset Wupatki Loop Road) and Forest Road 779. Boundaries consist of topography, an existing powerline, and the existing wilderness boundary.

This recommended wilderness has slopes, cinder cones, lava flows, as well as mostly flat terrain. Elevations range from 5,330 to 6,120 feet.

Dominant vegetation is pinyon juniper with isolated patches of Apache plume and ponderosa pine. It is dissected by several drainages, including Deadman's Wash. There is no natural water. Wildlife includes game animals and smaller wildlife species typical of the area.

Strawberry Crater Recommended Wilderness is on the fringe of the region covered by the eruption of Sunset Crater Volcano, and is an area that saw tremendous population increase after the eruption occurred in the latter part of the 11th century. Site density is very high, comparable to that of Wupatki National Monument, with a complete range of archaeological site types found in the Flagstaff region: artifact scatters, prehistoric fields, small field houses, pit house clusters, petroglyphs, and pueblos ranging from approximately 5 to 15 rooms in size.

#### **Davey's Recommended Wilderness**

Davey's Recommended Wilderness is a 1,739-acre area on the northwestern side of the Fossil Springs Wilderness. If designated, it would be an addition to the Fossil Springs Wilderness to the southeast. A powerline road and Forest Road 708 provide access and its boundaries include the powerline and existing wilderness.

Elevation ranges from 3,679 to 5,899 feet. Pinyon juniper and semi-desert grassland vegetation grow on the slopes and hills, providing habitat for species typically associated with this vegetation. There are about 20 acres of riparian vegetation.

Davey's Recommended Wilderness is on the flat tablelands that form the top of the Mogollon Rim. With moister climate regions in the prehistoric past, this part of the Coconino NF saw population increases by farming people. They built numerous small pueblos from which they tended farm plots using seasonally occupied field houses. The highlands of the Mogollon Rim have more prehistoric fields and field houses than any other part of the forest. Evidence of later use of the region by Apache is found with large agave roasting pits, scatters of stone flakes, and petroglyphs. Historic period use of the area is mostly related to cattle raising since the 1870s, and is reflected by line shacks, stock tanks, camp sites, and corrals scattered over the area. Centuries of land use make this an area of very high archaeological site density.

### **Desired Conditions for Recommended Wilderness**

#### **SA-RWild-DC**

- 1** The primitive and undeveloped characteristics of recommended wilderness are maintained or enhanced.
- 2** Ecological systems are substantially free from the effects of modern civilization, and evidence of modern human control or manipulation is reduced.
- 3** Native species and unique features of the area are preserved.
- 4** Scenery and wilderness recreation opportunities are emphasized.
- 5** There is little evidence of structures, construction, habitations, and other signs of modern human presence or occupation.
- 6** Mechanized recreation occurs at levels that maintain and do not detract from wilderness values.

### **Guidelines for Recommended Wilderness**

#### **SA-RWild-G**

- 1** Existing structures should be maintained, but not expanded, to maintain the area's wilderness character. Maintenance of existing structures should be carried out in a manner that does not expand the evidence of motor vehicle and mechanized equipment use beyond current conditions to maintain the area's wilderness character.
- 2** To maintain the area's wilderness character, construction of new Forest Service and permitted structures should not occur unless the structure's presence and future maintenance can be carried out in a manner consistent with the area's wilderness character.
- 3** Motor vehicle use should occur only for limited administrative and permitted activities, and as defined on motor vehicle use and over-snow vehicle maps, to be consistent with the area's wilderness character.
- 4** Trail maintenance should be conducted to be consistent with the primitive setting of the area.
- 5** New trails should be designed for non-motorized and non-mechanized activities to preserve the area's wilderness character.

### **Management Approaches for Recommended Wilderness**

Use the minimum requirement analysis as a framework to evaluate the potential effects of projects on wilderness character and to develop alternatives for projects within recommended wilderness.

Prioritize recommended wilderness boundary management where encroachments are likely to occur or management actions conflict with recommended wilderness.

## Designated and Eligible Wild and Scenic Rivers

See appendix A, map 3.

### General Description and Background for Designated and Eligible Wild and Scenic Rivers

The National Wild and Scenic Rivers Act was passed in 1968, with the purpose of implementing a governmental program to study and protect [free-flowing](#) river segments. Protected segments are considered part of the National Wild and Scenic River System and are designated by Congress. Eligible segments are free-flowing and have at least one [outstandingly remarkable value](#), but have not yet been designated by Congress. Outstandingly remarkable values are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values that make a river eligible for designation as a wild or scenic river. For additional information on the outstandingly remarkable values for each eligible river segment, consult the inventory and eligibility reports prepared by the Coconino NF and the Prescott NF (USDA Forest Service 2010c, USDA Forest Service 2015).

River segments are classified as wild, scenic, or recreational based on the level of development and access along the river corridor. Wild segments are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. Scenic segments are also free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads. Recreational segments are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past.

There are both designated and eligible wild and scenic river segments on Coconino NF (table 8).

**Table 8. Designated and eligible wild and scenic river segments on the Coconino NF**

Category	River/Segment	Total Segment Length* (miles)	Classification
Designated	Verde River	2.6	Wild
Designated	Verde River	18.4	Scenic
Designated	Fossil Creek, Segment 1	7.7	Recreational
Designated	Fossil Creek ,Segment 2	9.6	Wild
Eligible	Barbershop Canyon	13.5	Wild
Eligible	East Clear Creek	38.6	Scenic
Eligible	Leonard Canyon	23.5	Recreational
Eligible	Oak Creek, Segment 1	13.2	Recreational
Eligible	West Fork of Oak Creek	10.5	Wild
Eligible	Sycamore Creek	4.1	Wild
Eligible	Upper Verde River, Segment 4	6.7	Recreational
Eligible	West Clear Creek, Segment 1	32.6	Wild
Eligible	West Clear Creek, Segment 2	6.3	Scenic
Eligible	Wet Beaver Creek, Segment 1	13.6	Wild
Eligible	Wet Beaver Creek. Segment 2	5.0	Recreational

\*Distances are within the administrative boundary of the Coconino NF. Some reaches within the administrative boundary may not be located on lands managed by Coconino NF.



Each congressionally designated wild and scenic river is required to have a comprehensive river management plan. The comprehensive river management plan establishes the river corridor boundary; includes detailed descriptions of the outstandingly remarkable values; and addresses goals and desired conditions, development of lands and facilities, user capacities, water quality, instream flow, and monitoring strategy. It may also include plan components (desired conditions, objectives, standards, guidelines, and monitoring). These plan components are equivalent to and have the same weight as direction in this plan.

### **Designated Wild and Scenic Rivers**

#### ***Fossil Creek Wild and Scenic River Segment 1 and Segment 2***

Fossil Creek Wild and Scenic River was designated by Congress in spring 2009. This designation included approximately 17.3 miles from the confluence of Sand Rock and Calf Pen Canyons to the confluence with the Verde River. The river is managed jointly by the Tonto and Coconino NFs.

The Fossil Creek Wild and Scenic River is currently managed under interim direction until the comprehensive river management plan is completed under a separate decision.

#### ***Verde Wild and Scenic River***

The Verde Wild and Scenic River was designated by the Arizona Wilderness Act of 1984 (P.L. 98–406) on August 28, 1984. Beginning south of Camp Verde at Beasley Flat, the Verde Scenic River flows for approximately 18 miles, where it connects with the Verde Wild River west of Ikes Backbone and north of the confluence with Fossil Creek. The Verde Wild River then flows for 2.6 miles until it reaches the southernmost point of the Coconino NF. The segment then continues off-forest for an additional 19.6 miles into the Tonto NF. The wild and scenic river designation applies to both sides of the river and generally totals one-half mile wide (one-quarter mile on each side of the river). The area overlaps with a portion of Mazatzal Wilderness.

The Verde Wild and Scenic River is currently managed under a comprehensive river management plan developed by the Coconino, Prescott, and Tonto NFs.

### **Eligible Wild and Scenic Rivers**

#### ***Barbershop Canyon***

Barbershop Canyon is a 13.5-mile-long segment that starts near the Mogollon Rim and runs to the confluence of East Clear Creek. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the wild classification. This segment has outstandingly remarkable values in the form of fish habitat and scenery.

#### ***East Clear Creek***

East Clear Creek is a 38.6-mile-long segment that starts at the crossing of Forest Road 96 and runs northeast to the forest boundary. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the scenic classification. This segment has outstandingly remarkable values in the form of fish habitat and scenery.

*Leonard Canyon*

Leonard Canyon is a 23.5-mile-long segment that starts at the Knoll Lake Dam and runs to the confluence of East Clear Creek. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the recreational classification. This segment has outstandingly remarkable values in the form of fish habitat.

*Oak Creek, Segment 1*

Oak Creek – Segment 1 is a 13.2-mile-long segment that starts at the Sterling Springs Fish Hatchery and runs until the segment reaches private land. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the recreational classification. This segment has outstandingly remarkable values in the form of scenery, recreation, geology, fish habitat, riparian, and ecology.

*West Fork of Oak Creek*

West Fork of Oak Creek is a 10.5-mile-long segment that starts at the headwaters of the creek and runs to the confluence with Oak Creek. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the wild classification. This segment has outstandingly remarkable values in the form of scenery, recreation, geology, heritage, riparian, and ecology.

*Sycamore Creek*

Sycamore Creek is a 4.1-mile-long segment that starts at Parson Springs and runs to the confluence of the Verde River. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the wild classification. This segment has outstandingly remarkable values in the form of recreation, fish habitat, and riparian.

*Upper Verde River, Segment 4*

Upper Verde River, Segment 4, is a 6.7-mile-long segment that starts at the confluence with Sycamore Canyon and the Verde River and runs south to the boundary of the Prescott NF near Clarkdale, Arizona. The Coconino NF shares a boundary with the Prescott NF along 6.7 miles of this segment. This segment is administered under Prescott NF Forest Plan direction. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the recreation classification. This segment has outstandingly remarkable values in the form of scenery, recreation, heritage, wildlife, fish habitat, and botany.

*West Clear Creek, Segment 1*

West Clear Creek, Segment 1, is a 32.5-mile-long segment that starts at the headwaters for West Clear Creek and runs west to the western boundary of the West Clear Creek Wilderness. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the wild classification. This segment has outstandingly remarkable values in the form of scenery, recreation, geology, heritage, wildlife, fish habitat, riparian, and ecology.

*West Clear Creek, Segment 2*

West Clear Creek, Segment 2, is a 6.3-mile-long segment that starts at the western boundary of the West Clear Creek Wilderness and runs west to the Clear Creek dispersed camping area. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic

Rivers System under the scenic classification. This segment has outstandingly remarkable values in the form of recreation, heritage, wildlife, fish habitat, and riparian.

*Wet Beaver Creek, Segment 1*

Wet Beaver Creek, Segment 1, is a 13.6-mile-long segment that starts at the headwaters for Wet Beaver Creek and runs west to the western boundary of the Wet Beaver Wilderness. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the wild classification. This segment has outstandingly remarkable values in the form of scenery, recreation, geology, heritage, fish habitat, riparian, and ecology.

*Wet Beaver Creek, Segment 2*

Wet Beaver Creek, Segment 2, is a 5.0-mile-long segment that starts at the western boundary of the Wet Beaver Wilderness and runs west until the segment reaches private land. This segment has been identified as potentially eligible for inclusion in the National Wild and Scenic Rivers System under the recreation classification. This segment has outstandingly remarkable values in the form of scenery, recreation, heritage, riparian, and ecology.

**Desired Conditions for Designated and Eligible Wild and Scenic Rivers**

SA-WSR-DC

- 1 Designated and eligible wild and scenic river segments retain their free-flowing condition and their outstandingly remarkable values (that is, archaeological, scenic, fishery, wildlife, recreational, and botanical). Eligible classifications remain intact until further study is conducted or designation by Congress.
- 2 Activities in designated and eligible rivers and associated corridors are primarily nature-based, are consistent with the river's classification, and maintain the outstandingly remarkable values.
- 3 For designated wild and scenic rivers, roads and trails provide access consistent with the river segment classifications while protecting and enhancing the river's outstandingly remarkable values.
- 4 Educational materials and interpretation of designated and eligible wild and scenic rivers encourage widespread and common understanding of and support for values, philosophy, resources, and benefits. Consequently, residents and visitors not only appreciate and learn about wild and scenic rivers, but understand their role in protecting wild and scenic river values. This results in increased stewardship, ecological awareness, partnerships, and volunteerism.
- 5 The Verde Wild and Scenic River and associated corridor provide a variety of wildlife-based recreation opportunities. Visitors learn about native wildlife resources; understand species protection requirements and applicable laws and regulations; and are aware of the various recreation opportunities.
- 6 The Verde Wild and Scenic River offers river-related recreation opportunities that emphasize non-motorized recreation.

## **Guidelines for Designated and Eligible Wild and Scenic Rivers**

### **SA-WSR-G**

- 1 Recreation and other activities at designated and eligible rivers and associated corridors should be managed to occur at appropriate locations and intensities to protect and enhance the free-flowing condition, and the outstandingly remarkable values, consistent with the classification.

## **Management Approaches for Designated and Eligible Wild and Scenic Rivers**

Collaborate with neighboring forests and agencies on the management of designated and eligible wild and scenic rivers.

## **National Trails**

See appendix A, map 2.

### **General Description and Background for National Trails**

There are three national trails on the Coconino NF: the Arizona National Scenic Trail, General George Crook National Recreation Trail, and Wilson Mountain National Recreation Trail.

National Scenic Trails and National Recreation Trails are authorized under the National Trails System Act of 1968 (Public Law 90-543). These trails provide for increasing recreation needs for an expanding population and promote public access, travel and enjoyment of open-air outdoor areas of the Nation. Trails are established near urban areas and within scenic areas in more remote locations.

National Scenic Trail is a designation for protected areas that consist of trails of particular natural beauty and are designated by an act of Congress. These are extended trails that provide for maximum outdoor recreation potential and to promote the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the lands through which such trails may pass. A National Scenic Trail is to be managed to provide for its nature and purposes. Activities that would substantially interfere with the purposes for which the trail was designated should be avoided to the extent practicable (16 U.S.C. 1246). The overarching management direction for a National Scenic Trail is outlined in the Comprehensive Plan prepared for the trail. Motorized vehicle use by the general public is prohibited on National Scenic Trails, unless such use is consistent with the applicable policy set forth in the Comprehensive Plan. In general, established motorized uses, both summer and winter, are allowed to continue, but new motorized uses will not be designated on the trail.

National Recreation Trails provide a variety of outdoor opportunities in or near urban areas. The Secretary of Agriculture may establish and designate national recreation trails.

Connecting or side trails provide additional points of public access to national recreation and national scenic trails or provide connections between these trails.

### **Arizona National Scenic Trail**

Developed through a grassroots effort coupled with interagency partnerships, the Arizona Trail was designated by an act of Congress as a national scenic trail in 2009. The Arizona National

Scenic Trail (ANST) provides both short- and long-distance non-motorized recreation opportunities in mainly remote and undeveloped settings representative of the dramatic natural landscapes and varied vegetation of Arizona. It is intended to be a primitive, long distance trail that highlights the state's diverse geology, vegetation, wildlife, natural scenery, history, and culture. It connects deserts, mountains, forests, wilderness, canyons, historic sites, communities and people.

The ANST is an 800-mile continuous path from the border with Mexico to the border with Utah. The trail traverses some of the most scenic terrain in the state and areas rich in the history and culture of the Southwest. The visitor is treated to contrasts from the Sonoran desert, to grasslands, oak savannahs, mesquite groves, pinyon juniper woodlands, ponderosa pine, and mixed conifer forests, and riparian areas with large trees and lush vegetation. Cultural influences include prehistoric sites, historic mining activities, historic and present day ranching activities, and restoration activities intended to return forested land to a more sustainable natural condition.

On the Coconino NF, the ANST ascends the Mogollon Rim and crosses the canyons and ridges of the Upper Clear Creek watershed. In this area, visitors come across the historic site of the Battle of the Big Dry Wash and C.C. Cragin Reservoir. North of State Highway 87, the ANST crosses the grasslands, lakes, woodlands, and forests of Anderson Mesa. The ANST traverses the community of Flagstaff and then ascends the lower reaches of the San Francisco Peaks. From there, visitors continue north across the San Francisco Peaks volcanic field to the Kaibab NF and the Grand Canyon.

#### **General George Crook National Recreation Trail**

The General George Crook National Recreation Trail was established in 1979, under the authority of the National Trails System Act of 1968. It is an old military supply road along the Mogollon Rim. It was established by General George Crook, head of the military department, as a way of quickly moving troops between Fort Whipple, Fort Verde, and Fort Apache during the Apache Wars period of the 1870s and 1880s. The trail is multi-use and popular with equestrians and mountain bikers as well as hikers. The trail was blazed along the escarpment of the Mogollon Rim, from Fort Verde to Fort Apache.

#### **Wilson Mountain National Recreation Trail**

This trail was established in 1979, under the authority of the National Trails System Act of 1968. It is a strenuous hike to the top of Wilson Mountain, providing a panoramic view of the Oak Creek Canyon/Sedona area.

#### **Desired Conditions for National Trails**

SA-NatlTrails-DC

- 1 Scenic integrity and broad views of the surrounding landscapes are retained on national scenic trails and national recreation trails.
- 2 The integrity of cultural and natural resources, scenery, or recreational experiences is maintained along designated national trails on the Coconino NF.
- 3 In remote areas on national scenic trails, the sights and sounds of roads, motorized trails, utility corridors, and other facilities and infrastructure are rarely encountered.

- 4 National trails may be more accessible and highly developed near towns and developed recreation facilities. Connector trails provide access to amenities.
- 5 Signs, while unobtrusive, are present to help travelers find nearby developed sites, trailheads, recreation facilities, drinking water sources, and other points of interest.
- 6 The ANST is a well-defined trail that provides for high-quality hiking, horseback riding, mountain biking, and cross-country skiing on a shared trail with other compatible non-motorized uses. The trail is located in a highly scenic setting and the significant scenic, natural, historic, and cultural resources along the trail's corridor are conserved.
- 7 The ANST provides opportunities to experience a variety of vegetation, terrain, and scenery. Visitors can enjoy a simple day hike to multi-week hikes along the 8 trail passages (over 165 miles) that cross the forest. Wild and remote, backcountry segments of the route provide opportunities for solitude, immersion in natural landscapes, and primitive outdoor recreation. Front-country and more easily accessible trail segments connect to communities that lend their own character and history to each section of the trail.
- 8 The ANST is well maintained, signed, and passable. Alternate routes are made available in the case of temporary closures resulting from natural events, such as fire or flood, or land management activities.
- 9 The historic route, features, and associated values along the General George Crook Recreation Trail are preserved.
- 10 Foot and horse travel are the emphasized modes of transportation on the General George Crook Recreation Trail.

### **Standards for National Trails**

#### **SA-NatlTrails-S**

- 1 Protect General George Crook National Recreation Trail chevrons and route markers and historic milepost markers.

### **Guidelines for National Trails**

#### **SA-NatlTrails-G**

- 1 Recreational facilities on or adjacent to national trails should be designed to interpret and highlight associated points of interest.
- 2 Management activities should be designed and implemented to maintain long-term scenic values within and adjacent to national scenic trail corridors.
- 3 To retain the character for which a national scenic trail was designated, management activities should not result in recreation setting changes from less to more developed, particularly within the foreground.
- 4 Infrastructure and facilities should be designed to be compatible with the scenic, natural, historic, and cultural qualities for which a national scenic trail was established and the areas through which it passes.
- 5 New road or motorized trail construction across or adjacent to a national scenic trail should be avoided to protect the non-motorized setting and recreational experiences.

- 6 To retain or promote the purposes for which the ANST was designated, new or relocated trail segments should be located primarily within settings consistent with or complementing Primitive or Semi-Primitive Non-Motorized Recreation Opportunity Spectrum classes. Road and motorized trail crossings and other signs of modern development should be avoided to the extent possible.
- 7 In order to promote a non-motorized setting, the ANST should not be permanently re-located onto routes open to motor vehicle use. To further promote a non-motorized setting, the ANST should be relocated wherever the trail alignment is currently established on a road or former road prism.
- 8 Using the ANST for landings or as a temporary road for any purpose should not be allowed. The purpose of this guideline is to provide for a natural-appearing setting and to avoid visual, aural, and resource impacts.
- 9 Placement of new utility corridors and communication facilities across the ANST should be avoided to minimize scenic impacts and promote recreational experiences along the trail.
- 10 If forest health projects result in short-term impacts to the scenic integrity of the ANST, design features or mitigation measures should be included to minimize visual impacts within and adjacent to the trail corridor (within visible foreground at a minimum).
- 11 The General George Crook National Recreation Trail should be managed to preserve evidence of historic roadway and landscape character, including related historic trees, markers, gravesites, and water holes within a 200-foot corridor.

### **Management Approaches for National Trails**

Consider realigning national trails when currently located on existing roads or alternatively, consider converting roads to trails.

Coordinate with adjacent landowners and the Arizona Trail Association to maintain the ANST corridor and the condition and character of the surrounding landscape.

Encourage trail partners and volunteers to assist in the planning, development, maintenance, and management of the ANST, where appropriate and as consistent with the national scenic trail Comprehensive Plan.

Identify and pursue opportunities to acquire lands or rights-of-way within or adjacent to the ANST corridor.

Consider how activities outside the visible foreground may affect the ANST viewsheds and user experiences, and mitigating potential impacts to the extent possible.

Provide consistent signage along the ANST corridor at road and trail crossings to adequately identify the trail, and providing interpretive signs at key trail entry points and limited historic and/or cultural sites to orient visitors and enhance the visitor experience.

Ensure Incident Commanders are aware of the ANST as a resource to be protected during wildfire suppression activities, and clearly identify fire suppression rehabilitation and long-term recovery of the ANST corridor as high priorities for Incident Commanders, BAER Team Leaders, and post-fire rehabilitation efforts.

Establish appropriate carrying capacities for specific segments of the ANST, monitoring use and conditions, and take appropriate management actions to maintain or restore the nature and purposes of the ANST if the results of monitoring or other information indicate a trend away from the desired condition.

Manage the General George Crook Recreation Trail, corridor, associated historic sites, and side trails in cooperation with adjacent national forests, tribes, and private landowners for potential congressional designation as a national historic trail.

Collaborate with partners, including adjacent national forests and local entities, to develop a consistent representative visual logo for the General George Crook National Recreation Trail and to develop and provide consistent interpretation.

## Scenic Roads

See appendix A, map 2.

### General Description and Background for Scenic Roads

The term “scenic road” is a general term to describe federally or State-designated scenic roads. Several roads in the Coconino NF have special designations because of their scenic qualities, historical contributions, or other unique factors. Designations include All-American Roads and State-designated Scenic Roads (table 9).

All-American Roads are part of the National Scenic Byways Program; have features that do not exist anywhere else in the United States; and are unique enough to be tourist destinations unto themselves. State-designated scenic roads on the Coconino NF include scenic and historic roads.

**Table 9. National and State-designated scenic roads on the Coconino NF**

Designation Authority	Designation Type	Designated Roads
Federal	National Scenic Byways	Red Rock All-American Road, Historic Route 66 All-American Road (Ashfork to Lupton)
State	Scenic Roads	Dry Creek Scenic Road, San Francisco Peaks Scenic Road, Sedona-Oak Creek Scenic Road
	Historic Roads	Historic Route 66 (Ashfork to Lupton)

### Historic Route 66 All-American Road

Historic Route 66 All-American Road (or Route 66) is known as “The Mother Road” as it heralded the development of the U.S. highway system. State designation (Historic) was in December 1994, and Federal designation (All-American Road) was October 2009. With its history starting with American Indian trails across the country, it developed over the years into the first national highway linking Chicago and Los Angeles. Its route was pioneered along the 35th Parallel with the engineering explorations of Lieutenant Edward Fitzgerald Beale in 1857 to 1859. He later directed the construction of Beale Road, which opened up the western frontier for settlers, ranchers, and the military. When transcontinental railroad construction began in the 1880s, its route followed the Beale Road and encouraged the growth of towns and commercial development of the West. The main period of significance for Route 66 began with its construction in 1920 until 1944, when the Federal-Aid Highway Act (P.L. 78-521) was passed.



“The Main Street of America,” as it came to be known, was replaced in 1956, with the construction of Interstate 40.

Route 66 occupies a special place in American popular culture and history as it represents freedom, mobility, and adventure. Nowhere is that more prevalent than the open lands of northern Arizona along Route 66. The Mother Road, Main Street USA, and Get Your Kicks on Route 66 are all synonymous with this historic route. Unfortunately, the actual condition of the remaining route and its former attractions is less than desirable, and is the driving force behind efforts of communities along the byway to save what remains (Arizona Department of Transportation 2005). There are short segments of the official byway crossing the Coconino NF and many parallel routes that were formerly part of the Mother Road.

#### **Red Rock All-American Road**

The 7.5-mile Red Rock All-American Road, from milepost 302.5 to milepost 310.0 on State Highway 179, is a gateway to the Red Rock MA. The major buttes and scenic attractions that characterize the area are visible along the road. The Forest Service manages the majority of the viewshed, with the exception of the village of Oak Creek and Sedona.

#### **Dry Creek Scenic Road**

This scenic road is 6.5 miles of State Route 89A, located between milepost 363.5 and milepost 370. Associated points of interest include Red Rock State Park and Page Springs Hatchery.

#### **San Francisco Peaks Scenic Road**

This scenic road is 31.0 miles of Highway 180, located between milepost 224.0 and milepost 255.0. Associated points of interest include Museum of Northern Arizona, Hart Prairie Road, SnowBowl Ski Area, Lava River Cave and the Nordic Center.

#### **Sedona-Oak Creek Canyon Scenic Road**

This scenic road is 14.5 miles of State Route 89A located between milepost 375.5 and milepost 390.0. Associated points of interest include Oak Creek Vista, Grasshopper Point, Slide Rock State Park, and Red Rock-Secret Mountain Wilderness.

#### **Desired Conditions for Scenic Roads**

SA-ScenicRds-DC

- 1 Federally and State-designated scenic roads are preserved and promoted in a manner that protects their intrinsic qualities and enhances visitor appreciation of their resources, consistent with each designation.
- 2 Interpretation along Historic Route 66 All-American Road emphasizes local and national culture and history.
- 3 Views of prominent red rock formations such as Bell Rock, Courthouse Rock, and Cathedral Rock are unobstructed from the Red Rock All-American Road. Scenic pullouts are provided with safe vistas for photography and scenery viewing, facilities such as restrooms, and interpretive signs. Travel routes along this road safely accommodate bicycles and pedestrians and connect them to the urban trail system. Wildlife crossings reduce the risk of

wildlife-vehicle collisions. Alternative transportation is provided to increase the sustainability of tourism on this All-American Road.

- 4 Structures on or along federally or State-designated scenic roads harmonize with the surrounding features to the extent possible without compromising safety standards for the type of travel route.

### **Guidelines for Scenic Roads**

#### **SA-ScenicRds-G**

- 1 Features along the federally and State-designated scenic roads such as signs, guardrails, and landscaping should be designed to maintain the desired scenic character along the route.
- 2 Management activities and interpretation along Historic Route 66 All-American Road should follow the direction in the Arizona Historic Route 66 Corridor Management Plan (Arizona Department of Transportation 2009) to ensure consistency in the signs, and the architectural, and cultural landscape along the route.
- 3 Activities along federally and State-designated scenic roads should be consistent with the direction in established corridor management plans to ensure consistency with other jurisdictions.

### **Management Approaches for Scenic Roads**

Work closely with the Federal Highway Administration, Arizona Department of Transportation, Route 66 Scenic Byway Association, local communities, and other interested groups to promote and improve services and interpretive opportunities along federally and State-designated roads.

## **Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

See appendix A, map 2.

### **General Description and Background for Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

Research natural areas (RNAs) are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. RNAs are principally for nonmanipulative research, observation, and study. Any RNAs within existing wilderness are managed in accordance with agency policy on retaining wilderness character.

There are four existing RNAs on the Coconino NF: Casner Canyon, G.A. Pearson, Oak Creek, and San Francisco Peaks. The 609-acre Casner Canyon RNA is north of Schnebly Hill Road and is noted for the Arizona cypress, which is in an almost pristine condition on the area's lower slopes. The G.A. Pearson RNA is within the Fort Valley Experimental Forest and, therefore, is not managed by this plan. The 1,853-acre Oak Creek RNA is in the West Fork of Oak Creek within the Red Rock–Secret Mountain Wilderness. The Oak Creek RNA is an example of a biologically diverse creekside area and is a paleobotanical area containing plant species surviving from the last ice age. The 1,010-acre San Francisco Peaks RNA is within the Kachina Peaks Wilderness.

The San Francisco Peaks RNA preserves the characteristics of the transition zone between mixed conifer and alpine tundra with populations of bristlecone pine.

This plan proposes two new RNAs: West Clear Creek and Rocky Gulch, and a proposed expansion of the existing San Francisco Peaks RNA. The 1,007-acre West Clear Creek proposed RNA is an example of riparian communities associated with hanging gardens and springs in a steep canyon setting. The 926-acre Rocky Gulch proposed RNA is an example of old-growth ponderosa pine, and it is a control for research in the Beaver Creek watershed. The 141-acre proposed expansion to the east of the San Francisco Peaks RNA is an example of alpine tundra, a rare feature in the Southwestern Region.

Botanical and geological areas are designated for a special feature such as a rare plant community or exemplary geological formation. There are five botanical areas and two existing geological areas.

The 1,209-acre Verde Valley Botanical Area preserves a unique, limestone-dependent desert community containing the federally endangered Arizona cliffrose and an assemblage of other endemic plants.

The 339-acre Mogollon Rim Botanical Area preserves a representative portion of a white fir/bigtooth maple community. This community represents a unique vegetation community in Arizona and is found only at a few locations along the Mogollon Rim.

The 12-acre Fossil Springs Botanical Area preserves a highly diverse riparian deciduous forest associated with a large and complex spring system and travertine geology.

The 186-acre Fern Mountain Botanical Area preserves a unique high-elevation riparian scrub community dominated by Bebb's willow. This is one of the southernmost extents of this community.

The 1,201-acre Red Mountain Geological Area preserves the exposed and eroded internal structure of a symmetrical cinder cone within the San Francisco Peaks volcanic field.

The 763-acre Cottonwood Basin Geological and Botanical Area preserves cone-shaped geological formations that developed from physical and chemical weathering of fumeroles (old gas vents) in the Towel Creek Tuff. Towel Creek Tuff is volcanic ash deposited in Cottonwood Basin by the Hackberry Volcano 8 million years ago. The Cottonwood Basin Botanical Area preserves botanical diversity that is associated with the tuff, and that is approximately three times greater than typical semi-desert grassland. The area also contains a perennial spring. The designation of the Cottonwood Basin Geological and Botanical Area will be final with the signing of the Record of Decision associated with this plan.

### **Desired Conditions for Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

SA-RNABotGeo-DC

#### **Established and Proposed Research Natural Areas**

- 1 Established and proposed research natural areas have excellent examples of the ecological features for which they were designated, with little evidence of human activity or

disturbance. Visitor access and use occurs at levels that maintain the research, education, and biodiversity values of the established and proposed RNAs.

- 2 Established and proposed research natural areas function as reference areas to study natural ecological processes and as baseline areas for measuring long-term ecological change. Natural conditions and processes are maintained.
- 3 Genetic diversity in established and proposed research natural areas is preserved and maintained.
- 4 Established and proposed research natural areas provide opportunities for research, study, observations, monitoring, and for those educational activities that do not modify the conditions for which the areas were established.

#### **Designated Botanical and Geological Areas**

- 5 The unique characteristics of botanical and geological areas are protected and maintained. The inherent physical and biological processes of botanical areas and geological areas are sustained, and not negatively impacted from human activities or permitted uses. Natural processes continue to shape and define the unique features, characteristics, and formations of these areas.
- 6 Botanical areas and geological areas provide opportunities for study, monitoring, and interpretation.

#### **Objectives for Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

SA-RNABotGeo-O

- 1 Within 2 years of plan approval, prepare establishment reports for Rocky Gulch, West Clear Creek, and the eastern expansion of the San Francisco Peaks RNAs.

#### **Standards for Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

SA-RNABotGeo-S

- 1 Overnight camping and recreation campfires are prohibited in established RNAs.
- 2 Prohibit permitted commercial tours except in support of approved research or education in established RNAs.

#### **Guidelines for Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas**

SA-RNABotGeo-G

- 1 To support the area's purpose, human activities, permitted uses, and types and levels of access should be managed to protect the uniqueness and/or ecological condition of these special areas, and the values for which they were designated, established, or proposed.

- 2 In established and proposed research natural areas, fire management activities should be designed and implemented to mimic natural fire processes and should be compatible with ongoing research.
- 3 Fire should be managed using minimal impact suppression tactics or other appropriate suppression tactics to protect the resources for which research natural areas, botanical areas, and geological areas were designated, established, or proposed.
- 4 Allotment management plans should have provisions to protect the uniqueness and/or ecological condition of these designated, established, or proposed special areas that occur within an active grazing allotment.
- 5 Special use permits should be designed and implemented to retain the values for which the research natural area was established or proposed and to ensure that the area continues to function as a reference area to study natural ecological processes and as a baseline area for measuring long-term ecological change.
- 6 A permit should be required for noncommercial groups greater than 25 persons in Casner RNA and greater than 12 persons in the Oak Creek Canyon RNA to retain the values for which the research natural area was established or proposed and to ensure that the area continues to function as a reference area to study natural ecological processes and as a baseline area for measuring long-term ecological change.
- 7 Access within the Cottonwood Basin Geological and Botanical Area should be managed to limit access to foot traffic to protect the unique geological features, plant community, and ecology for which the area was designated.
- 8 Collection of rocks in geological areas should be only for approved scientific purposes and carried out under the appropriate authorization (such as a permit or agreement) to preserve the unique geological formations and to maintain the values for which the area was designated.
- 9 Access within the Red Mountain Geological Area should be limited to non-motorized recreation to protect the unique geological formations and other values for which the area was designated.

#### **Management Approaches for Established and Proposed Research Natural Areas and Botanical and Geological Areas**

Following plan approval, proposed RNAs will be evaluated by a regional committee. After compiling the necessary documentation, if this committee does not recommend that the Regional Forester and Station Director establish any proposed RNA or proposed addition, then these plan components will no longer apply to the proposed areas.

Encourage partnerships with interested parties to provide interpretation and monitoring for botanical areas and geological areas.

## Inventoried Roadless Areas

See appendix A, map 2.

### General Description and Background for Inventoried Roadless Areas

The U.S. Department of Agriculture adopted a final rule to establish prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands, effective March 13, 2001 (36 CFR 294; Federal Register Vol. 66, No. 9, pp. 3244-3273).

There are nine inventoried roadless areas on the forest totaling about 50,571 acres (table 10).

**Table 10. Inventoried roadless areas on the Coconino NF**

Name	Acres	Name	Acres
Barbershop Canyon	1,310	Jacks Canyon	2,855
Boulder Canyon	4,550	Lower Jacks Canyon	776
Cimarron Hills	5,300	Padre Canyon	9,424
East Clear Creek	2,035	Walker Mountain	6,378
Hackberry	17,873		

### Desired Conditions for Inventoried Roadless Areas

SA-IRA-DC

- 1 The inventoried roadless areas identified in the 2001 Roadless Area Conservation Rule maintain their overall roadless character.

### Standard for Inventoried Roadless Areas

SA-IRA-S

- 1 Projects and management activities shall be designed to maintain the overall roadless character of inventoried roadless areas.

## Chapter 4. Suitable Uses

### Introduction

The identification of an area as suitable for various uses is guidance for project and activity decision making and is not a commitment or a final decision approving or restricting projects and activities. Uses that are not specifically identified as suitable are generally not allowed and would be evaluated at the project level relative to desired conditions and could be reclassified as suitable. Uses that are neutral to or help move the Forest toward the desired conditions may be allowed. Uses that are suitable must also be consistent with other plan components and other laws and regulations.

### Timber Suitability

See appendix A, map 16.

National Forest System lands were reserved with the intent of providing goods and services to satisfy public needs over the long term. Among these goods is the production of a sustainable supply of forest products. The National Forest Management Act requires that National Forest System lands be classified as to their suitability for timber production.

Lands suitable for timber production are managed over time to produce periodic timber products on a sustained yield basis, as a desired outcome. Timber production is the purposeful growing, tending, harvesting, and regeneration of regulated crops of trees for industrial or consumer use on a sustained yield basis. Lands not suited for timber production are those where it is either not desirable or feasible to manage for periodic sustained yield harvests of forest products. Timber harvest may be part of a project outcome on lands not suited for timber production, but long-term sustained yield is not a desired management strategy. For example, restoration of grasslands often requires cutting trees. These trees can be harvested and made available for sale, but the intent for the future is to maintain these areas as grasslands, thus timber production is not desirable. Where long-term resource productivity would be impaired or law, regulation, or policy prohibits it, timber production is not feasible. The documentation for a timber production project should confirm the project area meets the suitability requirements.

In accordance with the provisions of the 1982 planning rule provisions and using guidance from the Southwestern Regional Office (USDA Forest Service 2011b), an analysis was conducted on all National Forest System lands managed by the Coconino NF to determine the acres of land that are categorized as suitable or not suitable for timber production. Table 11 provides acreages used in the timber suitability calculation. See the Vegetation and Fire section in appendix G, Timber Sale Schedule, Financial Evaluation, Allowable Sale Quantity, Long Term Sustained Yield, and Timber Suitability Calculation, of the Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan (USDA Forest Service 2018) for additional information about the methodology used to calculate timber suitability.

**Table 11. Timber suitability acreage calculation**

<b>Land Category</b>	<b>Acres</b>
Coconino NF (total managed ERUs acres)	1,842,965
Non-forested lands	-991,068
Lands withdrawn from timber production	-110,587
Lands where irreversible resource damage is likely	-48,495
Lands where adequate restocking is not assured	-79,564
<i>Subtotal of acres not suitable for timber production</i>	<i>1,229,713</i>
<b>Land Tentatively Suitable for Timber Production</b>	<b>613,251</b>
Lands where management prescriptions preclude timber production <sup>15</sup>	-82,200
Lands where management objectives limit timber harvest	0
Lands that are not economically cost efficient in meeting timber objectives <sup>16</sup>	-8,877
<i>Subtotal of acres not appropriate for timber production</i>	<i>91,077</i>
<b>Land Suitable for Timber Production</b>	<b>522,174</b>

## Grazing Capability and Suitability

See appendix A, map 17.

The 1982 Planning Rule requires that the suitability of rangelands on National Forest System lands and their potential capability for producing forage for grazing animals be determined in forest planning. Capability is the potential of an area of land to produce resources and supply goods and services. Capability depends upon conditions such as climate, slope, landform, soils, and geology. Suitability is the appropriateness of applying certain resource management practices to a particular area of land in consideration of the relevant social, economic, and ecological factors. Lands within the plan area are not suitable if livestock grazing would be incompatible with the desired conditions or result in substantial and permanent impairment of the land.

Capability to produce forage for grazing animals was determined for the original forest plan (USDA Forest Service 1987). Most landscape-scale conditions that influence capability have not changed significantly since the initial evaluation. However, the data and analysis tools used in the initial determination were not as accurate or precise as what is available today. Capability for this plan was reassessed using terrestrial ecosystem survey information (USDA Forest Service 1995) and U.S. Geological Survey (USGS) digital elevation models. Both of these data sources are the best available information at the landscape scale. USGS digital elevation models were used to identify areas with slopes greater than 40 percent. TEUI was used to identify areas that do not have the potential to produce 100 pounds of forage per acre per year and areas that have soils that are inherently unstable. Based on these three measures, 452,366 acres were determined to be not capable of producing forage for grazing animals. The remaining 1,390,598 acres were determined to have the capability to produce forage for grazing animals. The area capable for livestock

<sup>15</sup> Lands shall be tentatively identified as not appropriate for timber production to meet objectives of the alternative being considered if: based upon a consideration of multiple-use objectives for the alternative, the land is proposed for resource uses that preclude timber production (National Forest System Land and Resource Management Planning - 1982 Planning Rule, (219.14(c)(1)).

<sup>16</sup> Describes land where the cost for harvest and removal of material exceeds the value of the product.



grazing has about 0.7 percent more acres than the original forest plan. More detail about the process and rationale behind these calculations is documented in appendix C, Methodology and Analysis Process, of the accompanying Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan (USDA Forest Service 2017).

In the context of forest planning, suitability refers to the appropriateness of applying certain resource management practices to a particular area of land. Suitability is determined based on compatibility with desired conditions and objectives in the plan area. Lands within the plan area are not identified as suitable for a certain use if that use is prohibited by law, regulation, or policy; would result in substantial and permanent impairment of the productivity of the land or renewable resources; or if the use is incompatible with the desired conditions for the relevant portion of the plan area.

Identification of an area as suitable for a particular use does not mean that the use will occur over the entire area. Likewise, identifying that a particular use is not suitable does not mean that the use will not occur in specific areas. The identification of an area as suitable for various uses in the Forest plan is *guidance* for project and activity decision making and is *not a resource commitment or final decision* for projects and activities. Identification of grazing suitability as used in this context is a plan-level activity—grazing suitability is not revisited at the project (allotment) level. Final decisions on resource commitments are made at the project level. The final decision to authorize livestock grazing would be made at a project (allotment) level.

Grazing suitability determinations on the Coconino NF can be broken into three segments of time: suitability determinations made prior to the 1987 plan, suitability determinations made by the 1987 plan, and suitability determinations made since the approval of the 1987 plan. See table 12. This revised plan recognizes and carries forward the following grazing suitability determinations made on the Coconino NF.

Incorporating these segments together provides a complete picture of how the Coconino NF has considered grazing suitability over time and of the remaining lands on the Forest that are suitable for livestock grazing. Taken together, these suitability determinations have resulted in 235,256 acres of the Coconino NF being identified as not suitable for livestock grazing or browsing. The remaining 1,607,709 acres on the Coconino NF are suitable for livestock grazing or browsing. More detail about the process and rationale behind these calculations is documented in appendix C, Methodology and Analysis Process, of the accompanying Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan (USDA Forest Service 2018).

**Table 12. Areas unsuitable for grazing on Coconino NF**

Feature	Note
Allotments or portions of grazing allotments: Camp Verde, Cave Hill, Cottonwood, Cinder, Dry Creek, Deadman, Dove Tanks, Frisco Mountain, Hart Prairie, Indian Gardens, Middle Verde, Montezuma, Oak Creek, Rimrock, Tom's Creek, and Turkey Tanks	Areas closed to grazing prior to approval of the 1987 Coconino NF Forest Plan.
Strawberry Crater Wilderness	Areas closed to grazing upon approval of the 1987 Coconino NF Forest Plan
Tundra and upper mixed conifer/spruce-fir slopes within the Kachina Peaks Wilderness (areas above 9,500 feet elevation)	
Stoneman Lake Basin	
Oak Creek Canyon	
Developed recreation sites and Arizona Snow Bowl special use authorization area	
Inner Basin (formerly MA 16)	
Elden Environmental Study Area	
Old Cave Crater Environmental Study Area	
Griffith's Spring Environmental Study Area	Areas closed to grazing by site-specific NEPA decision since the approval of the 1987 Coconino NF Forest Plan
Highway 180 right-of-way	
Oak Creek Canyon Research Natural Area and Casner Research Natural Area	
Portions of the Buck Springs Allotment	
Riparian Habitat within the Verde Wild and Scenic River	
Portions of the Walnut Canyon Allotment	
Cinder Hills Off-highway Vehicle MA	
Sedona Allotment <sup>17</sup> , except for approximately 246 acres that is above the Mogollon Rim if it is realigned as part of the Windmill Allotment	
Boynton Canyon Allotment	
Horse Mesa Allotment	
South Gyberg, North Sycamore, South Sycamore, Loy Canyon, Secret Mountain, Winter Cabin, 060, and 051 Pastures of the Windmill West Allotment	

Table 13 and map 17 in appendix A show the areas on the Coconino NF where livestock grazing is not authorized due to incompatibility with desired conditions. As shown in table 13, of the 1,390,598 acres identified as potentially capable for livestock grazing, 82,322 acres are not

<sup>17</sup> The Forest is in the initial stages of an environmental analysis on the Windmill Allotment. The Forest is considering realigning the Windmill Allotment boundary to include a small portion of the Sedona Allotment due to its proximity and similarity to the Windmill Allotment and recent grazing history. The portion of the Sedona Allotment that is being considered for inclusion in the Windmill Allotment is located above the Mogollon Rim and adjacent to the Schnebly Pasture of the Windmill Allotment. It is approximately 246 acres and has similar soil and vegetation characteristics to those found in the adjacent areas on the Windmill Allotment. If this area is realigned as part of the Windmill Allotment, it will be considered suitable for livestock grazing for the purposes of this Plan.

suitable due to incompatibility with desired conditions. The total area that is both potentially capable and suitable is 1,308,276 million acres.

**Table 13. Lands potentially capable and suitable for grazing on the Coconino NF**

Land Category	Acres	Notes
Coconino NF (total managed acres)	1,842,965	
Lands not potentially capable	-452,367	Due to forage production, inherently unstable soil, and/or steep slopes, includes 152,934 acres that were determined to be not suitable for livestock grazing
Lands potentially capable for livestock grazing	1,390,598	
Lands not suitable for livestock grazing	-82,322	Total area determined to be not suitable includes 82,322 capable acres and 152,934 acres not potentially capable due to forage production, inherently unstable soil, and/or steep slopes
Lands potentially capable and suitable for livestock grazing	1,308,276	

## Recreation and Transportation Suitability

Suitability determinations in this plan are not decisions on whether existing recreation and transportation uses should continue. Existing recreation and transportation uses would not be immediately affected by the suitability determinations in this plan. However, future site-specific decisions could modify existing uses to conform to an area's suitability. Potential changes to the Forest's transportation system will be evaluated under the framework of this forest plan and through implementation of the Travel Management Rule.

The decision for implementation of the Travel Management Rule (73 FR 74689) on the Coconino NF is dated September 2011. Under this decision, the Forest has designated specific roads, trails, and areas suitable for motorized vehicle use. These designations have been identified on a motor vehicle use map and, in general, cross-country motorized travel is prohibited. This forest plan provides the framework in which the motor vehicle use map is developed and any other subsequent travel guidance on the Forest. The Travel Management Rule defines motorized travel as: movement using machines that use a motor, engine, or other nonliving power sources other than a vehicle operated on rails or a wheelchair or mobility device (including one that is battery powered) that is designed solely for use by a mobility-impaired person for locomotion and that is suitable for use in an indoor pedestrian area. This decision will be reviewed periodically to determine if changes should be made to which roads, trails, and areas are open to motor vehicle use on the Forest. Changes can be made for ecological or social reasons. The National Environmental Policy Act planning process is used to receive specific feedback on proposed motor vehicle use designation changes and, if warranted, to make designation changes.

Table 14 displays areas that are suitable or not suitable for motorized uses, mechanized travel, or non-motorized travel. These areas include new motorized areas, permanent roads, temporary roads, and motorized trails. These areas were determined based on the activities appropriate for the desired Recreation Opportunity Spectrum allocation and for special areas, given law, regulation, policy, and desired conditions.

A **new motorized area** is defined as an area that has been designated for off-road and off-trail cross-country motor vehicle use and travel. This does not apply to the Cinder Hills OHV Area.

**Permanent Roads** are defined as National Forest System roads (Operational Maintenance Levels 1 through 5) that the Forest Service determines are necessary for the protection, administration, and utilization of the National Forest System lands.

**Temporary roads** are defined as roads that are not National Forest System roads; that are not on the Forest Transportation Atlas; that are tracked by project or activity authorizing the temporary road; and that are decommissioned at the conclusion of the project or activity (FSM 7711.2)

**Motorized trails** are defined as a trail that is designated for motorized travel that is wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of National Forest System lands (FSM 2353.05).

**Mechanized travel** is defined as movement using any contrivance over land, water, or air, having moving parts that provides a mechanical advantage to the user and that is powered by a living or nonliving power source. This includes, but is not limited to: sailboats, hang gliders, parachutes, bicycles, game carriers, carts, and wagons. Mechanized travel does not include wheelchairs or mobility devices when used as necessary by a mobility-impaired person for locomotion ([Forest Service Manual](#) 2353.05). It also does not include skis, snowshoes, rafts, canoes, sleds, travois, or similar primitive devices without moving parts.

**Non-motorized travel** is defined as movement not relying on machines that use a motor, engine, or other nonliving power source (such as walking, canoeing, and horseback riding).

**Table 14. Recreation and transportation suitability**

<b>ROS &amp; Special Area Designations</b>	<b>New Motorized Areas</b>	<b>Permanent Roads</b>	<b>Temporary Roads</b>	<b>Motorized Trails</b>	<b>Mechanized Travel</b>	<b>Non-motorized Travel</b>
Urban, Rural, and Roaded Natural ROS	Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semiprimitive Motorized ROS	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Semiprimitive Non-motorized ROS	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Primitive ROS	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Designated and Proposed Research Natural Areas	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Botanical and Geological Areas	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable <sup>1</sup>	Suitable
Environmental Study Areas	Not Suitable	Not Suitable	Suitable	Not Suitable	Suitable	Suitable
Recommended Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable
Wilderness	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable
Eligible or Designated Wild and Scenic River – Recreation and Scenic	Not Suitable	Suitable	Suitable	Suitable	Suitable	Suitable
Eligible or Designated Wild and Scenic River – Wild	Not Suitable	Not Suitable	Not Suitable	Not Suitable	Suitable	Suitable

<sup>1</sup> Not Suitable except mechanized travel would be suitable on routes designated for mechanized travel.



# Chapter 5. Monitoring Strategy

## Introduction

Monitoring and evaluation are separate and sequential activities required by National Forest Management Act regulations to determine how well the plan is working. Monitoring involves collecting data by observation or measurement. Evaluation involves analyzing and interpreting monitoring data.

The purpose of monitoring and evaluation is to evaluate, document, and report how the forest plan is applied, how well it works, and if its purpose and direction remain appropriate. Based upon this evaluation, recommendations may be made to the forest supervisor to change management direction, or revise, or amend the forest plan. The monitoring and evaluation report is intended to inform [adaptive management](#) of the plan area especially in light of changing social or environmental conditions.

In general, evaluations of the monitoring information consider the following questions:

- What are the effects of resource management activities on the productivity of the land?
- To what degree are resource management activities maintaining or making progress toward the desired conditions and objectives identified in the plan?
- Have there been unanticipated changes in conditions? Can changes be attributed to climate change? What modifications are needed to account for these changed conditions?

The following guiding principles are key elements of the monitoring strategy and serve as a framework for implementing an effective monitoring and evaluation program:

- Monitoring efforts are efficient, practical, and affordable, make use of the best available science, and do not duplicate the collection of data already underway for other purposes.
- Monitoring tasks are scaled to the desired condition, objective, or management area direction to be monitored.
- Monitoring is not performed on every single activity, nor does it need to meet the statistical rigor of formal research.
- Budgetary constraints may affect the level of monitoring that can be done in a particular fiscal year. If budget levels limit the Coconino NF's ability to perform all monitoring tasks, then those items specifically required by law are given the highest priority.
- Opportunities to complete monitoring and evaluation activities through partnerships and citizen collaboration are examined on a regular and ongoing basis.
- A monitoring and evaluation report is prepared that summarizes the results of completed monitoring and evaluates the data for indicators of trends or effects.
- The forest supervisor evaluates the monitoring information displayed in the evaluation reports through a management review and determines if any changes are needed in management actions or the forest plan itself.
- The public is given timely, accurate information about forest plan implementation. This is done through the release of a monitoring and evaluation report.

The plan is ordinarily revised on a 10- to 15-year cycle and the forest supervisor may amend the plan at any time. All of the monitoring and evaluation timeframes identified in this chapter begin from the date of the record of decision.

## Monitoring Plan

The monitoring plan includes the following: monitoring questions that describe the actions, effects, or resources to be evaluated; scale of the question; what is being measured; the source of the information; the frequency of monitoring and reporting, and the expected precision/reliability of the monitoring process (table 15).

- **Monitoring Question:** The question(s) that will be answered. All questions are at the geographic scale of the Forest unless indicated otherwise.
- **Metrics and Data Sources:** The evaluation criteria and data sources available to evaluate the monitoring questions at the time of plan approval. These are not the required methods of measurement. As new tools become available, other methods may be used to answer the monitoring questions.
- **Frequency of Monitoring:** How often information is gathered or measured.
- **Frequency of Evaluation:** How often the information is analyzed and reported. Available monitoring information will be evaluated and reported every two years.
- **Data Precision and Reliability:** An indication of how rigorous the information used to evaluate the monitoring question is with respect to repeatability, reliability, accuracy, and precision. Two categories of precision and reliability are appropriate at the plan scale, and because of varying methods and data sources used to evaluate the monitoring question, both classes may be indicated. Classes of precision and reliability, however, are not meant to identify which methods and data sources may be most appropriate to answer the monitoring question.
  - **Class A:** Methods that are generally well-accepted for modeling or quantitative measurement. Results have a high degree of repeatability, reliability, accuracy, and precision.
  - **Class B:** Methods or measurements that are based on project records, personal communications, ocular estimates, pace transects, informal visitor surveys, and similar types of assessments. The degree of repeatability, reliability, accuracy, and precision are not as high as Class A methods, but they still provide valuable information.

Monitoring and evaluation are identified, approved, and scheduled through the annual budget process. Actual budget levels, funding emphasis, and emergence of new issues may affect accomplishment of both management activities that make progress toward desired conditions as well as monitoring. Budgetary constraints may affect the level of monitoring that can be done in a particular fiscal year. If budget levels limit the Coconino NF's ability to perform all monitoring tasks, then those items specifically required by law are given the highest priority. Partnerships may be developed to accomplish monitoring and evaluation.



Table 15. Coconino NF plan monitoring questions

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
1	What is the contribution of forest management to air quality in the three smoke management units that overlap the Coconino NF (Colorado River airshed, Little Colorado River airshed, Verde River airshed) when there are exceedances of State of Arizona's air quality standards? Scale: Greater than forestwide	Metric: Various, depending on pollutant. Source: Data from any Arizona Department of Environmental Quality (ADEQ) air quality monitoring station in the three smoke management units that overlap the forest. Evaluation: Forest activities that relate to air quality on day of exceedance.	Information is collected by ADEQ daily.	A
2	What is the contribution of forest management to visibility within the Sycamore Wilderness and Mazatzal Wilderness Class I Areas when there are exceedances of the Regional Haze Implementation Plan? Scale: Greater than forestwide	Metric: Various, depending on pollutant. Source: Data from IMPROVE <sup>1</sup> program (Environmental Protection Agency air quality monitoring stations at Ike's Backbone and Sycamore Canyon). Evaluation: forest activities that relate to visibility on day of exceedance.	Weekly	A
3	How much have management activities contributed to maintaining or making progress toward DCs related to vegetation structure for the Semi-desert Grassland and Pinyon Juniper with Grass ERUs?	Metric: Acres of vegetation treated in each ERU. Source: Database of record such as FACTS <sup>2</sup> database (Forest Activity Tracking System).	Annually	A
4	Are downed logs and snags falling within the ranges established in desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?	Metric: Frequency of snags and downed logs. Source: Field data and database of record such as FACTS.	3 to 5 years	A
5	Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine and Mixed Conifer with Frequent Fire ERUs?	Metric: Basal area. Source: Field data and database of record such as FACTS.	3 to 5 years	A
6	How much have management activities contributed to reducing the risk of uncharacteristic fire?	Metric: acres mechanically treated, acres of prescribed fire, acres of wildfire for resource objectives. Source: Database of record such as FACTS.	Annually	A

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
7	How much have management activities contributed to returning fire to fire-adapted ecosystems?	Metric: acres of prescribed fire and acres of wildfire managed for resource objectives that maintain or move towards desired conditions in the forest plan. Source: Database of record such as FACTS.	Annually	A
8	How much have management activities improved functional-at-risk or nonfunctional stream riparian areas and wetlands?	Metric: acres/miles of functional-at-risk or nonfunctional stream riparian areas improved and number and acres of functional-at-risk or nonfunctional wetlands improved. Source: Database of record such as WIT <sup>3</sup> database (Watershed Improvement Tracking).	Annually	A, B
9	How much have management activities contributed to the restoration of riparian function to springs not in proper functioning condition?	Metric: number of springs improved or restored. Source: Database of record such as WIT.	Annually	A
10	How many water rights have been procured or how many water rights filings have been done?	Metric: Number of water rights procured or filings completed Source: USDA Forest Service Water Rights and Uses (WRU) database and Arizona Department of Water Resources	Annually	A
11	What are surface water trends for Oak Creek, Wet Beaver Creek, and Fossil Creek?	Metric: Annual mean discharge and peak streamflow Source: U.S. Geological Survey Gaging Stations	Annually	A
12	How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species?	Metric: miles of streams and acres of lakes, ponds, or wetlands with non-native species removal or are affected by a fish barrier or other structure. Number of new populations of aquatic invasive species. Source: surveys and reports, including from partner agencies and organizations (such as Fossil Creek native fish annual monitoring report); information from State and Federal agencies on new populations of aquatic invasive species.	Annually	A, B
13	How much have management activities contributed toward reducing the incidence or abundance of invasive plants?	Metric: Acres of invasive plants treated. Source: Database of record such as FACTS.	Annually	A

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
14	To what extent are undesirable outbreaks of insects and pathogens occurring on the forest? (1982 Planning Rule (sec. 219.12(k)(5)(iv))	Metric: acres of damage or mortality. Source: Forest Health and Condition Report, Southwestern Region.	Annually	A, B
15	How much have implemented projects and soil best management practices contributed to protecting soil, reducing accelerated erosion, reducing soil compaction, and maintaining soil and nutrient cycling thus maintaining long term soil productivity?	Metric: Acres of implemented projects that maintain or trend toward satisfactory soil condition. Acres and number of projects where BMP implementation was effective at protecting soil productivity. Source: Field data from a sample of implemented projects on the forest (soil condition and soil productivity), including implemented BMPs.	Every 3 to 5 yrs for soil condition assessments. Annually for BMP implementation.	B
16	Have management activities contributed to impairment of warm water or cold water streams based on aquatic macroinvertebrate metrics? Aquatic macroinvertebrates are an <a href="#">ecological indicator</a> of water quality.	Metric: Streams added to or removed from ADEQ's impaired or non-attaining list. Source: ADEQ 305(b) reports.	Every 3 years.	A
17	Have management activities contributed to the delisting and improvement of impaired waters, or waters non-attaining Arizona water quality standards?	Metric: number of streams or lakes removed or added to ADEQ's impaired or non-attaining list. Source: ADEQ 305(b) reports.	Every 3 years	A
18	How much have management activities contributed to maintaining or moving towards desired conditions of functioning properly for priority 6th code watersheds identified in the watershed condition assessment?	Metric: Acres of watershed maintenance or restoration activities and acres of vegetation treatments within priority 6th code watersheds. Name and number of 6th code watersheds that have moved to an improved class. Source: In forestwide WCATT (Watershed Condition Assessment Tracking Tool) and database of record such as FACTS.	Every 3 to 5 years	A

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
19	<p>A. How much have management activities improved habitat for aquatic and riparian-dependent threatened, endangered, or proposed species? (Related to question 8)</p> <p>B. How much have management activities contributed to reducing the incidence or abundance of aquatic invasive species in habitat for threatened, endangered or proposed species? Related to question 10.</p>	<p>A. Metric: acres/miles of functional-at-risk or nonfunctional stream riparian areas improved and number and acres of functional-at-risk or nonfunctional wetlands improved as related to threatened, endangered, and proposed species habitat.</p> <p>A. Source: Database of record such as WIT database.</p> <p>B. Metric: miles of streams and acres of lakes, ponds, or wetlands with non-native species removal or are affected by a fish barrier or other structure.</p> <p>B. Source: project files for structures completed.</p> <p>B. Metric: Number of new populations of aquatic invasive species.</p> <p>B. Source: surveys and reports, including from partner agencies and organizations (such as Fossil Creek native fish annual monitoring report); information from State and Federal agencies on new populations of aquatic invasive species.</p>	Annually	B
20	<p>A. What are the status and trends of pronghorn (a management indicator species) populations on the Forest?</p> <p>B. How much have management activities contributed to maintaining or moving towards desired conditions for pronghorn habitat: Semi-desert Grassland, Great Basin Grassland, and Montane/Subalpine Grassland ERUs? 1982 Planning Rule (219.19 (a)(6))</p>	<p>A. Metric for pronghorn population trend: Increasing, Decreasing or Stable – Qualitative.</p> <p>B. Metrics for pronghorn habitat: Acres of vegetative treatments (prescribed cutting, prescribed burning, wildfire managed for resource objectives), acres of invasive plant treatment, and miles of road decommissioned or naturalized in grassland habitats.</p> <p>A and B. Sources: Results of surveys from Arizona Game and Fish Department. Database of record such as FACTS.</p>	Annually	A, B

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
21	<p>A. What are the status and trends of pygmy nuthatch (a management indicator species) populations on the Forest?</p> <p>B. Are snags falling within the range established in desired conditions for Ponderosa Pine ERU, habitat for pygmy nuthatches, an <a href="#">MIS</a> species?</p> <p>C. Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine ERU?</p> <p>D. How much have management activities contributed to reducing the risk of uncharacteristic fire in Ponderosa Pine ERU?</p> <p>E. How much have management activities contributed to returning fire to Ponderosa Pine, a fire-adapted ecosystem? 1982 Planning Rule (219.19 (a)(6))</p>	<p>A. Metric for pygmy nuthatch population trend: Increasing, Decreasing, or Stable (Qualitative).</p> <p>B, C, D, and E. Metrics for pygmy nuthatch habitat: Frequency of snags. Basal area. Acres mechanically treated; acres of prescribed fire, acres of wildfire for resource objectives.</p> <p>A, B, C, D, and E. Sources: Results from surveys conducted by Bird Conservancy of the Rockies. Field data and database of record such as FACTS.</p>	Annually	A
22	<p>A. What are the status and trends of Mexican spotted owls (a threatened species and a management indicator species) populations?</p> <p>B. Are downed logs and snags falling within the range established in desired conditions for Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs?</p> <p>C. Are tree densities within forested areas falling within the basal area ranges established in the desired conditions for Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs?</p> <p>D. How much have management activities contributed to reducing the risk of uncharacteristic fire in Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs?</p> <p>E. How much have management activities contributed to returning fire to Ponderosa Pine, Mixed Conifer with Frequent Fire, and Mixed Conifer with Infrequent Fire ERUs?</p>	<p>A. Metric for Mexican spotted owl population trend: Increasing, Decreasing, or Stable (Qualitative).</p> <p>B, C, D, and E. Metrics for Mexican spotted owl habitat: Frequency of snags. Basal area. Acres mechanically treated; acres of prescribed fire, acres of wildfire for resource objectives.</p> <p>A. Source: Broadscale monitoring results from Southwestern Regional Office.</p> <p>B, C, D, and E. Sources: Field data and database of record such as FACTS.</p>	Annually	A, B

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
23	How much have management activities contributed to maintaining or moving toward desired conditions for aspen? Aspen is an ecological indicator of habitat diversity, and early seral stages in the following ERUs: Mixed Conifer with Infrequent Fire, Mixed Conifer with Frequent Fire, Spruce-Fir, and in localized areas in Ponderosa Pine.	Metric: Acres of aspen protected or maintained. Source: Database of record such as FACTS database.	Annually	A
24	Have areas classified as unsuited for timber production become suitable? (sec. 219.12(k)(5)(ii))	Metric: Acres of suitable timber. Method: Reapply timber suitability criteria and process. Source: TimCo (Timber code) Forest Service database	Every 10 years	A
25	Are forests and woodlands adequately restocked within 5 years of final harvest treatment when openings are created for the purpose of regeneration? (sec. 219.12(k)(5)(i))	Metric: Percentage of area adequately restocked. Source: Review annual reforestation needs report, stocking certifications, silvicultural prescriptions, and FACTS database.	1 to 5 years	A, B
26	Should maximum size limits of 40 acres for even-aged management harvest areas be continued? (sec. 219.12(k)(5)(iii)), 219.27 (d)(2)	Metric: Percentage of harvest units that exceed 40 acres for even-aged management. Source: FACTS database.	1 to 5 years	A, B
27	How many new recreation opportunities have been added to the system?	Metric: Number of new facilities. Number of miles and type of new trails provided. Source: INFRA <sup>4</sup> database	Every 5 years	A
28	How many recreation sites or locations have been improved, relocated, or decommissioned in response to known resource damage?	Metric: Number of facilities or dispersed sites. Source: INFRA database, PALS (Planning, Appeals, Litigation System) Forest Service database	Every 5 years	A
29	How much have management activities contributed to progress toward scenic integrity desired conditions in areas identified as needing rehabilitation?	Metric: Percentage of acres that have been thinned <u>and</u> burned and that improved (by at least one level) areas identified as needing rehabilitation. Source: FACTS database, Scenery Management – Scenic Integrity Objectives Rehabilitation Map (map14) included with the plan, and other areas identified by scenery resource specialists as needing rehabilitation.	Annually	A, B

Question Number	Questions	Metric and Data Source	Monitoring Frequency	Data Precision and Reliability
30	Have there been changes that have resulted in unforeseen issues requiring plan amendments? (sec. 219.12(k))	Metric: Number, type, and content of plan amendments. Source: database of record for number, type, and content of plan amendments.	Annually	B
31	How do actual accomplishments compare with plan objectives? (sec. 219.12(k)(1))	Metric: Various, as described in plan objectives. Source: database of record for the various accomplishments, such as: FACTS, INFRA, PALS, and WIT databases.	Annually	B

<sup>1</sup> The Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring program was established in 1985 to aid the creation of Federal and State implementation plans for the protection of visibility in Class I areas (156 national parks and wilderness areas) as stipulated in the 1977 amendments to the Clean Air Act.

<sup>2</sup> FACTS refers to the Forest Activity Tracking System database that is part of the Natural Resource Manager's (NRM) system of database tools for managing agency data across the Forest Service. It is an activity tracking application for all levels of the Forest Service. The application allows tracking and monitoring of National Environmental Policy Act (NEPA) decisions as well as the ability to create and manage Knutson-Vandenberg (KV) trust fund plans at the timber sale level.

<sup>3</sup> WIT refers to the Watershed Improvement Tracking database that is part of the NRM system of database tools for managing agency data across the Forest Service. WIT manages data, observations and planning details about sites that need to be (or have been) restored or improved with the intent of benefiting watershed and aquatic ecosystem health and function. The application is a watershed restoration activity tracker that addresses site conditions, administrative plans and actions, and outcomes.

<sup>4</sup> INFRA refers to the Infrastructure database that is part of the NRM system of database tools for managing agency data across the Forest Service





# List of Preparers

Following is a list of the names, titles, and education and professional experience of individuals who contributed substantially to the revision of the Land and Resource Management Plan for the Coconino National Forest.

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Name	Title	Education and Experience
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# Glossary

**Accessibility** – According to section 504 of the Rehabilitation Act of 1973 (P.L. 93-112), all Federal programs and facilities are required to be “to the highest degree feasible, readily accessible to and usable by all persons who have a disability, including mobility, visual, hearing, or mental impairments.”

**Adaptive management** – General framework encompassing the three phases of planning: assessment, plan development, and monitoring (36 CFR 219.5). This framework supports decision making that meets management objectives while simultaneously accruing information to improve future management by adjusting the plan or plan implementation. Adaptive management is a structured, cyclical process for planning and decision making in the face of uncertainty and changing conditions with feedback from monitoring, which includes using the planning process to actively test assumptions, track relevant conditions over time, and measure management effectiveness.

**Administrative site** – A site used by the Forest Service for the administrative activities such as offices, storage, and interpretive centers.

**Age class** – Refers to trees that originated within a relatively distinct range of years. Typically, the range of years is considered to fall within 20 percent of the average natural maturity (such as if 100 years is required to reach maturity, then there would be five 20-year age classes).

**Allotment** – A designated area available for livestock grazing upon which a specified number, kind of livestock, and season of use may be grazed under a term grazing permit. The basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.

**Aquatic emergent vegetation** – Aquatic plants with some or most of the leaf area extending out of the water.

**Aquatic management zone** – This zone generally follows the shape of the streamcourse or riparian areas and consists of vegetation and vegetative litter. The purpose is to buffer against detrimental changes in the temperature regime, chemical composition, blockages of streamcourses, or deposits of sediment which seriously and adversely affect water conditions or fish habitat. Consideration of topography, vegetation, soil, climatic conditions, management objectives, and other factors determine what management practices can occur within an aquatic management zone or what mitigation measures should be implemented.

**Basal area** – The cross-sectional area at breast height (4.5 feet above the ground) of trees measured in square feet. Basal area is a way to measure how much of a site is occupied by trees. The cross-sectional area is determined by calculating the tree’s radius from its diameter (diameter/2 = radius) and using the formula for the area of a circle ( $\pi \times \text{radius}^2 = \text{cross-sectional area}$ ). Basal area per acre is the summation of the cross-sectional area of all trees in an acre or in a smaller plot used to estimate basal area per acre. Diameter at root collar (defined below) is used to calculate the cross-sectional area of multi-stemmed trees such as juniper and oak.

**Base-for-exchange lands** – National Forest System lands available for exchange to other landowners (see definition for land adjustments).

**Bedload** – Sand, silt, gravel, soil, or detritus, carried by a stream on or immediately above the bottom.

**Best management practices (BMPs)** – With respect to water resources, the method, measure, or practice selected by an agency to meet its nonpoint-source pollution control needs. BMPs include, but are not limited to, structural controls, operations, and maintenance procedures. BMPs can be applied before, during, or after pollution-producing activities to reduce or eliminate the introduction of pollutants into the water.

**Biological soil crusts** – Crusts of soil particles formed by living organisms (such as algae, mosses, lichens) in arid areas. They hold soil in place, help retain moisture, and improve soil nutrients by fixing atmospheric nitrogen.

**Cienega** – Typically a low-gradient, often spring-fed wet meadow or marsh.

**Class I Area** – Under the Clean Air Act of 1963, a Class I area is one in which visibility is protected more stringently than under the national ambient air quality standards; it includes national parks, wilderness areas, monuments, and other areas of special national and cultural significance.

**Climax** (seral stages) – The stage where an ecosystem has reached a steady state. Through the process of ecological succession, an equilibrium is reached in which the biological community is best adapted to the average conditions in that area.

**Clump** – Refers to a tight cluster of two to five trees of similar age and size originating from a common rooting zone that typically lean away from each other when mature. A clump is relatively isolated from other clumps or trees within a group of trees, but a stand-alone clump of trees can function as a tree group.

**Coarse woody debris** – Woody material on the ground greater than 3 inches in diameter, including logs.

**Concern level roads** – Concern Level 1 roads are travel routes where forest visitors have a high interest in scenic qualities. Concern Level 2 roads are travelways where forest visitors have a moderate interest in scenic qualities.

**Condition class** – The Forest Service Manual (FSM 2521.1) uses three classes to describe watershed condition:

- **Class 1** watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are functioning properly.
- **Class 2** watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are functioning at risk.
- **Class 3** watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition and are impaired function.

**Constructed feature** – Anything constructed by the Forest Service or by a permittee for use in administering National Forest System lands. When used in the context of scenery, the term refers to anything that is built in the landscape.

**Culturally important** – Relates to the plants, animals, or locations that are traditionally important to a specific group to maintain their cultural identity.



**Cultural resources overview** – A study of published and unpublished documents, records, files, registers, and other sources, resulting in analysis and synthesis of all reasonably available data. A cultural resources overview encompasses prehistoric, historic, and ethnological/sociological elements and, in large part, chronicles past land uses. It may have major relevance to current land use decisions.

**Declining** – Refers to the senescent (aging) period in the lifespan of plants that includes the presence of dead and/or dying limbs, snag tops, and other characteristics that indicate their later life stages.

**Decommission** – Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1).

**Designated Beneficial Uses** – Arizona Department of Environmental Quality State water quality standards are associated with designated beneficial uses. Designated beneficial uses vary by stream or lake and include aquatic and wildlife, full or partial body contact, fish consumption, domestic water source, agriculture irrigation, and agriculture livestock watering.

**Designated motorized routes and area** – Routes and areas designated on the motor vehicle use map and established by a decision that is compliant with the 2005 Travel Management Rule.

**Desirable non-native species** – Non-native species with high positive social or economic value.

**Desired landscape character** – Described in the Scenery Management System Handbook as, “The most complete, attractive and sustainable expression of the desired landscape character which is compatible with that landscape’s fully integrated set of desired conditions” (Handbook page 5-5 expanded). Desired landscape character represents the most “ideal” and attractive scenic identity that is possible, given the limitations of the ecosystem and achievement of other resource objectives as defined in the desired conditions.

**Developed recreation** – Recreation that occurs at human-made developments such as campgrounds, picnic areas, resorts, ski areas, and trailheads. Facilities might include: roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings. Campgrounds and picnic areas are examples of developed recreation sites.

**Developed recreation site** – A distinctly defined area where facilities are provided for concentrated public use (such as campgrounds, picnic areas, or swimming areas).

**Diameter at breast height (d.b.h.)** – The diameter of a tree typically measured at 4.5 feet above ground level.

**Diameter at root collar** – The diameter of a woodland tree typically measured at ground line, on the main branch below any branching.

**Dispersed camping** – Camping outside of a developed camping facility.

**Dispersed recreation** – The type of outdoor recreation that tends to be spread out over the land and in conjunction with roads, trails, and undeveloped waterways. Activities are often day-use oriented and include hunting, fishing, boating, hiking, off-road vehicle use, cross-country skiing, mountain biking, and rock climbing.

**Disturbance** – A relatively discrete event in time that disrupts ecosystem, watershed, community, or species population structure and/or function and changes resources, substrate availability, or the physical environment. Disturbances can be natural (for example, fire, flooding, or insects) or human-caused (for example, vegetation treatments, prescribed fire, or wildfires managed for resource objectives).

**Easement** – The right of use over the property of another. The land having the right of use is known as the dominant estate and the land that is subject to the easement is known as the servient estate.

**Ecological Response Unit (ERU)** – ERUs represent an ecosystem stratification based on vegetation characteristics that would occur when natural disturbance regimes and biological processes prevail and combine potential vegetation and historic fire regimes to form ecosystem classes useful for landscape assessment (USDA Forest Service 2014).

**Ecological Indicator** – A plant or animal whose population dynamics reflect significant changes in the conditions or productivity of an ecosystem (FSM 2605). Plant and animal species, communities, or special habitats with a narrow range of ecological tolerance. Such indicators are selected for emphasis and monitored during forest plan implementation because their presence and relative abundance serve as a barometer of ecological conditions within a management unit (FSM 2620.5).

**Ecosystems** – Spatially explicit, relatively homogeneous units of the Earth that include all interacting organisms and elements of the abiotic environment within its boundaries. An ecosystem is commonly described in terms of its:

- **Composition** – the biological elements within the different levels of biological organizations, from genes and species to communities and ecosystems.
- **Structure** – the organization and physical arrangement of biological elements such as snags and down woody debris, vertical and horizontal distribution of vegetation, stream habitat complexity, landscape pattern, and connectivity.
- **Function** – ecological processes, such as energy flow; nutrient cycling and retention; soil development and retention; predation and herbivory; and natural disturbances such as wind, fire, and floods that sustain composition and structure.

**Ecotone** – A transition zone between two distinct ecological communities.

**Endemic** – (1) A population that has unique genetic characteristics (if known) and likely exists in a very limited geographic area. Narrowly endemic refers to a species or subspecies that has extremely limited distribution and/or habitat in Arizona.

(2) A population of native insects, disease, plants, or animals which perform a function role in the ecosystem when they are present at low levels, or constantly attack just a few hosts throughout an area, but it can become potentially injurious when they increase or spread to reach outbreak (epidemic) levels.

**Erosion** – The processes whereby earthy or rocky material is worn away, loosened, dissolved, and removed from any part of the Earth's surface.

**Erosion hazard** – The risk of erosion and sedimentation that is based on slope, soil type, and the amount and type of material on the ground that is able to trap eroded material.

**Even-aged stand** – Tree stands that are composed of one distinct age class of trees.

**Facility** – Structures needed to support the management, protection, and use of the national forests including roads, trails, buildings, utility systems, dams, and other construction features. There are three types of facilities: recreation, administrative, and permittee.

**Federally listed species** – A species listed under the provisions of the Endangered Species Act.

**Fire intensity** – Fire intensity represents the energy released during the phases of combustion. Fire intensity includes measures of the amount of heat produced by the flaming front, the residence time or the amount of time that the heat is present at a given location, and the rate at which the flaming front is progressing. These three measures directly influence the vegetative effects that the fire will produce. A low-intensity fire refers to a flaming front that is progressing at a rate in which the amount of heat produced and residence time do not result in highly damaging vegetative effects (Keely 2009).

**Fire regime** – Refers to the patterns of fire that occur over a long period of time across an appropriately scaled area and its immediate effects on the ecosystem in which it occurs. An ecosystem's natural fire regime is the one that existed prior to human-facilitated interruption of fire frequency, extent, or severity. Five fire regimes are classified based on frequency (average number of years between fires) and severity (amount of replacement on the dominant overstory vegetation) of the fire. These five regimes are:

- **Fire Regime I** – 0 to 35 year frequency and low (surface fires most common, isolated torching can occur) to mixed severity (less than 75 percent of dominant overstory vegetation replaced);
- **Fire Regime II** – 0 to 35 year frequency and high severity (greater than 75 percent of dominant overstory vegetation replaced);
- **Fire Regime III** – 35 to 100+ year frequency and mixed severity;
- **Fire Regime IV** – 35 to 100+ year frequency and high severity; and
- **Fire Regime V** – 200+ year frequency and high severity.

**Fire severity** – A measure of the direct effects of the fire on vegetation. Low severity generally replaces less than 25 percent of the dominant overstory vegetation. Mixed-severity fires burn with mixed effects from low to high severity, and high-severity fires are considered those that replace more than 75 percent of the dominant overstory vegetation. (Keely 2009)

**Floodplain** – That portion of a stream valley, adjacent to the channel, which is covered with water when the stream overflows its banks at flood stages.

**Forage** – Browse (woody vegetation like shrubs or trees) and herbaceous vegetation (grasses and forbs) that is available to and may provide food for grazing animals (domestic or wild) or be harvested for feeding.

**Forage Production** – The weight of forage that is produced within a designated period of time on a given area. The weight may be expressed as either green, air-dry, or oven-dry. The term may also be modified as to time of production such as annual, current year's, or seasonal forage production (Glossary of Terms Used in Range Management; 4th Edition; Society for Range Management 1998).

**Forage Reserves** – Areas created from former allotments or pastures that are appropriate for temporary or emergency grazing.

**Forb** – Any herbaceous broad-leaved plant species.

**Foreground** – A term used in the Scenery Management System to generally denote the visible area from the observer to a half a mile away. Foreground visibility is modeled at the landscape scale for the Scenery Management System and is further determined at the site-specific project level.

**Forest Service Handbook (FSH)** – Forest Service Handbooks are the principal source of specialized guidance and instruction for carrying out the direction issued in the FSM. Specialists and technicians are the primary audience of handbook direction. Handbooks may also incorporate external directives with related USDA and Forest Service directive supplements.

**Forest Service Manual (FSM)** – The Forest Service Manual contains legal authorities, objectives, policies, responsibilities, instructions, and guidance needed on a continuing basis by Forest Service line officers and primary staff in more than one unit to plan and execute assigned programs and activities.

**Fragmentation** – A process that occurs wherever a large, contiguous habitat is transformed into smaller patches that are isolated from each other by a landscape unlike the original. This landscape can differ from the original habitat in either composition or structure, and it functions as either a partial or total barrier to the distribution of the species associated with the original habitat. A major threat to the viability of wildlife species is when fragmentation leads to the isolation of pairs and populations.

**Free flowing** – Defined by the National Wild and Scenic River Act of 1968 (P.L.90-542) as “existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. The existence, however, of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion....”

**Fugitive dust** – Particles lifted into the ambient air caused by human-made and natural activities such as the movement of soil, vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines; from portable brazing, soldering, or welding equipment; and from piledrivers.

**Functioning ecosystem** – An ecosystem that contains all components and processes necessary to maintain resilience over time.

**Functioning properly** – Watersheds are functioning properly when they have the following five important characteristics (Williams et al. 1997):

1. They provide for high biotic integrity, which includes habitats that support adaptive animal and plant communities that reflect natural processes.
2. They are resilient and recover rapidly from natural and human disturbances.
3. They exhibit a high degree of connectivity longitudinally along the stream, laterally across the floodplain and valley bottom, and vertically between surface and subsurface flows.

4. They provide important ecosystem services, such as high quality water, the recharge of streams and aquifers, the maintenance of riparian communities, and the moderation of climate variability and change.
5. They maintain long-term soil productivity.

Using this framework, watersheds can be classified into one of three conditions:

Class 1 watersheds (**Functioning Properly**), which exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

Class 2 watersheds (**Functioning at Risk**), which exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

Class 3 watersheds (**Impaired Function**), which exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

**Gap** – Refers to the space occurring in a forested area as a result of individual or group tree mortality from small disturbance events or from local site factors such as soil properties that influence vegetation growth patterns.

**Geomorphology** – The classification, description, nature, origin, and development of present landforms and their relationships to underlying structures and of the history of geologic changes as recorded by these surface features.

**Graminoids** – A grass or grasslike plant; includes grasses, sedges, rushes, cattails, and arrowgrass.

**Grazing Permit** – A document authorizing livestock to use National Forest System lands or other lands under Forest Service control for livestock production (FSM 2230.5, 2005).

**Groundwater recharge** – Recharge is the process by which groundwater is replenished. A recharge area is where water from precipitation is transmitted downward to an aquifer. Recharge is promoted by natural vegetation cover, flat topography, permeable soils, a deep water table, and the absence of confining beds.

**Groups** – A cluster of two or more trees with interlocking or nearly interlocking crowns at maturity surrounded by an opening. Size of tree groups is typically variable depending on forest type and site conditions, and can range from fractions of an acre (a two-tree group) (ponderosa pine, dry mixed conifer) to many acres (wet mixed conifer, spruce-fir). Trees within groups are typically nonuniformly spaced, some of which may be tightly clumped.

**Group site** – A recreation site designed to accommodate group events such as family gatherings.

**Heritage asset** – Property, plant, and/or equipment that are unique for one or more of the following reasons: historical or natural significance; cultural, educational, or artistic importance; or significant architectural characteristics.

**Historic vegetation conditions** – Historic refers to using a combination of historic range of variability and site-specific evidences to guide how desired conditions are implemented on the ground. **Reference conditions**, often characterized by historic range of variability (HRV), provide a scientific basis for understanding forests, and a framework for understanding forest conditions and ecological processes prior to extensive human influence. Reference conditions provide a best estimate of a functional and sustainable system, and are a useful basis for developing desired conditions while accounting for uncertainties (such as climate change). Desired conditions use historical ecology within the context of HRV in each ERU, in addition to social and economic considerations, as a template for management action. Action is focused on bringing the ecosystem to the desired condition by restoring composition, structure, and function on the same or similar trajectory. The range of natural variability differs across sites, both within and among vegetation types, because landscapes vary widely in soils, elevation, aspect, species composition, structure, and pattern (Southwestern Region 3 Desired Conditions paper 2014). Historical evidence (old trees, large snags and logs, old stumps) on sites are used to develop desired conditions and guide prescriptions at the site level (Moore et al. 1999, Friederici 2003, Reynolds et al. 2006).

**Hydrologic unit code (HUC)** –All of the watersheds in the United States are classified in a nested arrangement of hydrologic units from largest to smallest and are identified with hydrologic unit codes (HUCs). A watershed is a delineated area or basin in which surface water collects and is funneled into larger and larger areas. Groupings of 6th code watersheds form 5th code watersheds and groupings of 5th code watersheds form 4th code watersheds and so on.

**Hydrology** – The study of the behavior of water in the atmosphere, on the Earth's surface, and underground.

**Immediate foreground** – A term used in the Scenery Management System to denote the detailed feature landscape found within the first few hundred feet of the observer, generally, from the observer to 300 feet away. Immediate foreground visibility is modeled at the landscape scale for the Scenery Management System and is further determined at the site-specific project level.

**Impaired waters** – See definition for **Water quality categories**.

**Improvement** – Human-made developments such as roads, trails, fences, stock tanks, pipelines, power and telephone lines, survey monuments, and ditches.

**Inclusion** – A variance in vegetation within a vegetation type due to landform, moisture regime, soil type, erosion, or past disturbance.

**Infiltration** – The process of water entering the soil. The rate of infiltration is the maximum velocity at which water enters the soil surface.

**Integrated pest management approach** – A broad-based ecological approach to structural and agricultural pest control that integrates pesticides/herbicides into a management system, incorporating a range of practices for economic control of a pest.

**Interpretation** – Information services designed to present inspirational, educational, and recreational values to forest visitors to provide the utmost in understanding, appreciation, and enjoyment from their forest experience.

**Interspaces** – Areas not currently under the vertical projection of the outermost perimeter of tree canopies. They are generally composed of grass-forb-shrub communities, but could also be areas with scattered rock or exposed mineral soil. Interspaces do not include meadows, grasslands, rock

outcroppings, and wetlands (that is, exclusions adjacent to and sometimes within forested landscapes).

**Invasive species** – Any species that is non-native (or alien) to the Forest and whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health. Invasive species can be identified within any of the following four taxonomic categories: Plants, Vertebrates, Invertebrates, and Pathogens. There is a link to Federal and state invasive plant species lists on the U.S. Department of Agriculture, Natural Resource Conservation Service website. The National Invasive Species Information Center provides information on invasive vertebrates, invertebrates, and microbes.

**Inventoried roadless area (IRA)** – Areas, typically of 5,000 acres or greater, which were identified in the Roadless Area Review and Evaluation in 1979.

**Karst** - Terrain with distinctive landforms and hydrology created from the dissolution of soluble rocks, principally limestone and dolomite. Karst landscapes are commonly characterized by sinkholes, collapse features, caves, springs, or streams that go underground. Karst terrain can also influence groundwater systems and vegetative, wildlife, and aquatic communities.

**Land adjustment** – Land adjustments are the acquisition or disposal of national forest system lands through the following processes: sale, purchase, exchange, conveyance, rights-of-way, interchange, and grants.

**Landscape character** – Particular attributes, qualities, and traits of a landscape that give it an image and make identifiable or unique (USDA Forest Service 2000).

**Land exchange** – The conveyance of non-Federal land or interest in the land to the United States in exchange for National Forest System land or interest in the land.

**Land purchase** – The conveyance of non-Federal land or interest in the land to the United States by fee-simple purchase.

**Leasable minerals** – Leasable minerals are not locatable and are subject to leasing under the Mineral Leasing Act and include oil, gas, gypsum, and geothermal. By the lease terms, the lessee has the legal right to drill or mine subject only to the terms and conditions of the lease.

**Litter** – The uppermost layer of organic debris on the ground, composed mainly of fresh or slightly decomposed leaves, bark, twigs, flowers, fruits, and other vegetative matter.

**Locatable minerals** – Minerals that are regulated under the provisions of the 1872 Mining Law and include gold, silver, uranium, and many others. Locatable mineral uses can occur unless the lands are withdrawn from mineral entry.

**Macrophyte** – An aquatic plant that grows in or near water and is either emergent, submergent, or floating. Macrophytes provide cover for aquatic and riparian species, serve as substrate for aquatic invertebrates, produce oxygen, and act as food for some fish and wildlife.

**Management indicator species (MIS)** – Plant or animal species or habitat components selected in the planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

**Mechanically treat** – For the purposes of this plan, mechanical treatments include most vegetation treatments except fire. They may include mechanized cutting, hand thinning, and other silvicultural treatments. This process is also referred to as “prescribed cutting.”

**Memorandum of understanding** – A legal agreement between the Forest Service and other agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project. A memorandum of understanding is not a fund-obligating document.

**Mesquite bosque** – Elevated 6 to about 45 feet above the water table, with riparian ecosystems. The canopy layer of bosques is dominated by mesquite species and individual trees could reach over 30 feet in size and over 3 feet in stem diameter. The understory can support a diverse assemblage of shrubs, vines, and herbaceous plants. Mesquite bosques produce abundant fruits and flowers in part because of their deep root systems and a symbiotic relationship with nitrogen-fixing bacteria. Consequently, breeding bird density is high. In areas with broad valley floodplains and at stream confluences, stands of mesquite trees occur on floodplain terraces above the stream channel. Where the terraces are within 14 meters of groundwater, larger form mesquite trees occur and are characterized by connecting canopies with fairly open understories. These mesquite bosques (Spanish for woodlands), provide a unique habitat for an assemblage of wildlife species. In some cases, riparian obligates need the adjacent mesquite bosques in addition to the riparian corridor for their life history requirements.

**Metapopulation** – A population structure in which spatially separated populations of the same species exist on patches that are dynamic in space and time (Helms 1998). These individual or subpopulations are connected by pathways of immigration and emigration, and exchange of individuals occurs between subpopulations. Emigrating individuals are able to colonize currently unoccupied patches of suitable habitat, including previously occupied patches from which the species has recently become extinct (Lincoln et al. 1998).

**Mineral materials** – A collective term used to describe petrified wood and common varieties of sand, gravel, stone, pumice, pumicite, cinders, clay, and other similar materials. Common varieties do not include deposits of those materials that are valuable because of some property giving them distinct and special value (36 CFR228.42). Bureau of Land Management makes the determination of which minerals are considered common variety.

**Mineral withdrawal** – Mineral withdrawal reserves public lands from entry by leasable or locatable mineral entry. To request a mineral withdrawal, the Forest Service must submit a request and documentation to the Bureau of Land Management.

**Mollisols** – Soil order in USDA soil taxonomy. Mollisols are dark-colored, base-rich soils with high amounts of organic matter, found mainly in Great Basin Grassland and Montane Grassland ERUs.

**Mosaic** – The pattern of patches, corridors, and matrices (forest or non-forest) that form a landscape in its entirety.

**Motorized use** – Defined as the use of a vehicle that is self-propelled other than a vehicle operated on rails or a wheelchair or mobility device (including one that is battery powered) that is designed solely for use by a mobility-impaired person for locomotion and that is suitable for use in an indoor pedestrian area (36 CFR 212.1)



**Motor vehicle use map** – A map displaying designated roads, trails, and areas for motor vehicle use on an administrative unit or a ranger district of the National Forest System.

**Narrowly endemic** – See definition for Endemic.

**National Environmental Policy Act (NEPA)** – An act declaring a national policy to encourage productive and enjoyable harmony between people and their environment, to promote efforts that will prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of people, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality (P.L. 91-190).

**National forest land and resource management plan** – A plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378), as amended, that guides all resource management activities and establishes management standards and guidelines for National Forest System lands of a given national forest.

**National Forest System lands** – Federal lands that have been designated by Executive Order or statute as national forest, national grasslands, or purchase units, or other lands under the administration of the Forest Service.

**National historic trail** – National historic trails were authorized under the National Trails System Act of 1968 (P.L. 90-543) along with national scenic trails and national recreation trails. National scenic trails and national historic trails may only be designated by an act of Congress.

**National Register of Historic Places** – A list of heritage resources that have local, state, or national significance maintained by the Secretary of the Interior.

**Native species** – All indigenous terrestrial and aquatic species that evolved naturally in an ecosystem.

**Natural** – When used in the context of ecological composition, structure, and process, the term natural refers to the range of past conditions and processes that provide important framework and guidance relevant to the environments and habitats in which native species evolved. Disturbance-driven spatial and temporal variability is vital to ecological systems. Biologically appropriate disturbances provide for heterogeneous conditions and subsequent diversity. Conversely, “uncharacteristic disturbance” such as high-severity fire in plant communities that historically had a frequent low-severity fire regime can have the effect of reducing diversity, increasing homogeneity, and resulting in states that may be permanently altered.

**Natural fire regime** – The fire regime that existed prior to human-facilitated interruption of frequency, extent, or severity.

**Naturalize** – The intent of naturalizing a road is to return a roadbed to as close to its original state as possible. This could include ripping up the road surface, seeding with grass and shrubs, and building in proper drainage structures to ensure the roadbed does not decay into an unnatural drainage in the watershed.

**Niche** – The locality where an organism may generally be found and where all essentials for its development and existence are present. Habitat niches are described by their geographical boundaries, or with terms such as “shady woodlands,” “banks of streams,” and “dry hillsides.”

**Non-motorized** – Movement that does not rely on machines that use a motor, engine, or other nonliving power source (such as walking, canoeing, and horseback riding). Non-motorized travel does not include mechanized travel.

**Non-native** – See definition for Invasive species.

**No surface occupancy (NSO)** – A fluid mineral leasing stipulation that prohibits occupancy or disturbance on all or part of the land surface to protect special values or uses. The NSO stipulation includes stipulations that may have been worded as “No Surface Use/Occupancy,” “No Surface Disturbance,” “Conditional NSO,” and “Surface Disturbance or Surface Occupancy Restriction by location.” Lessee may exploit the oil and gas or geothermal resources under leases restricted by this stipulation through use of directional drilling from sites outside the NSO area.

**Northern goshawk foraging areas** – Areas surrounding the post-fledging areas (see below) where northern goshawks hunt for prey. The areas are approximately 5,400 acres in size.

**Northern goshawk nest areas** – Areas immediately around a nest that northern goshawks use for courtship and breeding activities. The areas are approximately 30 acres in size and contain multiple groups of large, old trees with interlocking crowns.

**Northern goshawk post-fledging areas** – Areas that surround the nest areas. They represent an area of concentrated use by the northern goshawk family until the time the young are no longer dependent on adults for food. Post-fledging areas are approximately 420 acres in size (not including the nest area acres).

**Noxious weed** – A legal term applied to plants regulated by Federal and state laws, such as plants designated as noxious weeds by the Secretary of Agriculture or by the responsible state official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insect or disease, and being not native or new or not common to the United States or parts thereof. This plan uses the term *invasive*, rather than noxious. The term *invasive* incorporates the definition of noxious.

**Nurse trees** – Larger, faster growing trees that shelter smaller, slower growing trees or plants.

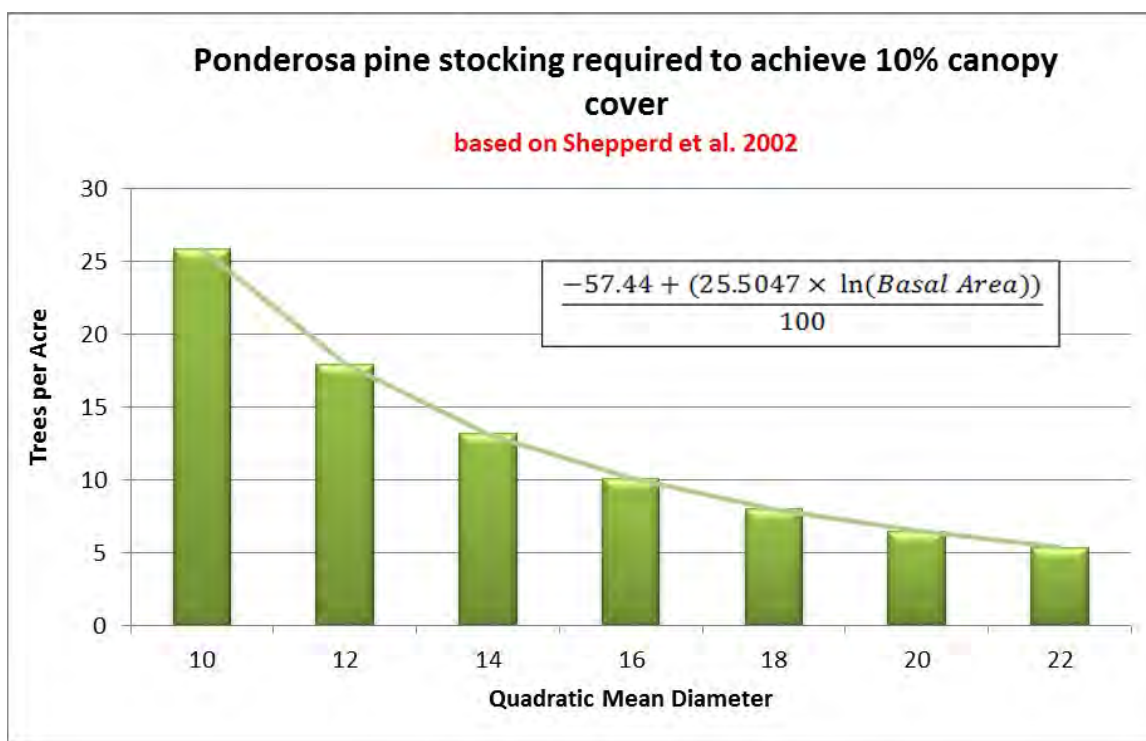
**Off-highway vehicle** – Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

**Old growth** – Old growth in southwestern forested ecosystems is different than the traditional definition based on northwestern infrequent fire forests. Due to large differences among forest types and natural disturbances in the Southwest, old-growth forests vary extensively in tree size, age classes, presence and abundance of structural elements, stability, and presence of understory. Old growth refers to specific habitat components that occur in forests and woodlands—old trees, dead trees (snags), downed wood (coarse woody debris), and structure diversity. These important habitat features may occur in small areas, with only a few components, or over larger areas as stands or forests where old growth is concentrated. In the Southwest, old growth is considered “transitional,” given that the location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality). Some species, notably certain plants, require “old forest” communities that may or may not have old-growth components, but have escaped significant disturbance for lengths of time necessary to provide the suitable stability and environment.

**Open pit** – Shallow human-made open pond or pit used on a drill site or production pad to hold produced water or fluids from drilling. “Closed” pits refer to the use of tanks to store these types of fluids.

**Openings** – Areas greater than 0.10 acre generally devoid of trees because they either:

- 1) preclude tree growth (such as rock outcroppings, wetlands [natural openings]) or
- 2) were the site of a complete stand-clearing disturbance event (also natural openings) or
- 3) meet both 3a and 3b:
  - a) forest land currently having less than 10 percent canopy cover (any appropriate method, such as algorithmic relationships, growth simulators, remote sensing, or direct measurement, may be used to determine existing canopy cover [for example figure 5]) and
  - b) forest land having the site capacity but an insufficient number of established seedlings (or larger trees) to sustain at least 10 percent tree canopy cover at maturity (any appropriate method, such as algorithmic relationships and growth simulators, may be used to determine the number of established seedlings required to achieve 10 percent canopy cover at maturity based on post-treatment stocking and seedling growth).



**Figure 5. Minimum stocking of various sized ponderosa pines required to achieve 10 percent canopy cover**

Openings are distinct from meadows and grasslands and are generally composed of grass-forb-shrub communities, but could also be areas with scattered rock or exposed mineral soil. Openings are generally larger than interspaces and should not be confused with interspaces, which are areas between and among trees that are capable of supporting tree growth but, at a given point in time, are absent of tree canopy (typically created and maintained by lower severity disturbances [such

as frequent fire])). If an area does not meet at least one of the criteria above, then it is not an opening.

**Openness** – The estimated inverse of forest canopy cover for a given area. For example, a forest with 70 percent canopy cover would have openness of 30 percent.

**Outstanding Arizona Waters** – Surface water that is classified as an outstanding state resource water by the Director of the Arizona Department of Environmental Quality under R18-11-112.

**Outstandingly remarkable values (ORVs)** – Scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values that make a river eligible for designation as a wild or scenic river.

**Overland flow** – A condition in which the precipitation rate is faster than the infiltration rate, and excess water runs over the surface of land.

**Overstory** – That portion of a plant community consisting of the taller plants on the site; the forest or woodland canopy.

**Patches** – Areas larger than tree groups in which the vegetation composition and structure are relatively homogeneous. Patches comprise the mid-scale, thus they range in size from 100 to 1,000 acres.

**Perennial stream** – Permanently inundated surface streamcourse. Surface water flows throughout the year except in years of infrequent drought.

**Planned ignition** – A fire ignited by management actions under certain predetermined conditions to meet plan desired conditions. Prescribed fire is a synonymous term.

**Prescribed cutting** – Vegetation removal under conditions specified in an approved plan to remove unwanted fuels; create openings; stimulate growth of desired vegetation; change seral stages; and to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives. This process is also referred to as “mechanical treatment” or to “mechanically treat.”

**Prescribed fire** – Fire burning under conditions specified in an approved plan to dispose of fuels, control unwanted vegetation; stimulate growth of desired vegetation; change seral stages; and to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives. Prescribed burns occur under specified environmental conditions that allow the fire to be confined to a predetermined area and produce the fireline intensity and rate of spread required to meet management objectives.

**Priority heritage assets (PHAs)** – Heritage assets of distinct public value that are, or should be, actively maintained. The significance and management of a PHA must meet one or more of the following criteria: (1) recognized through an official designation such as a listing on the National Register of Historic Places, State Register, and so forth; (2) recognized through prior investment in preservation, interpretation, and use; (3) recognized in an agency-approved management plan; or (4) exhibits critical deferred maintenance, which is defined as a potential health or safety risk, or imminent threat of loss of significant resource values. Any improvement to a PHA that meets real property designation criteria is now considered real property.

**Probable Fossil Yield Classification** – A system used to classify geologic units based on the relative abundance of vertebrate fossils or scientifically significant invertebrate (or plant) fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential.

The Probable Fossil Yield Classification system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources.

- **Class 1** – Igneous and metamorphic (ashes are excluded from this category) geologic units that are not likely to contain recognizable fossil remains.
- **Class 2** – Sedimentary geologic units that are not likely to contain vertebrate fossils nor scientifically significant nonvertebrate fossils.
- **Class 3** – Fossiliferous (fossil containing), sedimentary geologic units whose fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.
- **Class 4** – Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.
- **Class 5** – Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant nonvertebrate fossils and that are at risk of natural degradation and/or human-caused adverse impacts.

**Proper functioning condition** – Riparian areas and wetlands are functioning properly when adequate vegetation, landform, or large woody debris is present to: dissipate stream energy associated with high flows (thereby reducing erosion and improving water quality); filter sediment; capture bedload and aid in floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks; develop diverse ponding and channel characteristics to provide habitat for fish, waterfowl and other uses; and support greater biodiversity.

- **Functional at risk** – Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.
- **Nonfunctional** – Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and, consequently, are not reducing erosion and improving water quality.

**Property classes** – A term used in heritage resources management for site types or combinations of site types.

**Pseudokarst** – Landform terrain and features analogous to karst, but formed from processes that are not from solution of bedrock. Lava flows may feature a variety of pseudokarst features including open lava tubes, hollow tumuli (oval to domed hillocks in pahoehoe lava), hollow flow lobes and tongues of lava, open vertical volcanic conduits, tree and animal mold caves, hollow hornitos (steep-sided hollow eruptive volcanic vents) and hollow volcanic dikes. Other types of pseudokarst that could occur on the Forest include badland and piping pseudokarst, crevice and talus pseudokarst (Halliday 2007).

**Receptors** – Areas sensitive to air quality impacts where exceeding the Federal or local standard may not be the only limitation or where visibility restrictions are important.

**Recreation Opportunity Spectrum (ROS)** – Framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences are arranged across a continuum or spectrum of six classes: primitive, semiprimitive non-motorized, semiprimitive motorized, roaded natural, rural, and urban.

- **Primitive** – Characterized by an essentially unmodified natural environment of a fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within these areas is prohibited. There is an extremely high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge and risk.
- **Semiprimitive Non-motorized** – Non-motorized backcountry area with a predominantly natural-appearing environment, without evidence of resource modification and utilization practices. Provides opportunities for self-reliance and challenge, with a low concentration of users and high degree of interaction with the natural environment. Recreation developments are rustic and rudimentary and primarily provided for the protection of the resources rather than the convenience of users.
- **Semiprimitive Motorized** – Similar setting to semiprimitive non-motorized except this area provides a motorized backcountry experience where trails and primitive roads are designed for high-clearance, four-wheel-drive vehicles. Moderate probability of experiencing solitude. High degree of self-reliance and challenge in using motorized equipment. These areas are predominantly natural, lacking some human modification, except when necessary for site protection.
- **Roaded Natural** – Characterized by a predominantly natural-appearing environment with moderate evidence of human activity. Resource modification and utilization practices are evident, but harmonize with the natural environment. May have a mosaic of highly modified areas to pockets of unmodified lands. Developed sites provide for some user comfort as well as site protection, but harmonize with the natural environment.
- **Rural** – A substantially modified natural environment. There is evidence of resource modification and utilization practices, and facilities are often designed for larger numbers of people. Campgrounds often include paved roads, electricity, and other conveniences.
- **Urban** – Landscape character that has resulted from extensive human activities, no longer appearing natural, such as conversion of native landscapes into an extensively altered landscape (such as a town, city, or metropolitan area).

**Reference conditions** – Environmental conditions that infer ecological sustainability. When available, reference conditions are represented by the characteristic range of variation (not the total range of variation), prior to European settlement and under the current climatic period. For many ecosystems, the range of variation also reflects human-caused disturbance and effects prior to settlement. It may also be necessary to refine reference conditions according to contemporary factors (such as invasive species) or projected conditions (such as climate change). Reference conditions are most useful as an inference of sustainability when they have been quantified by amount, condition, spatial distribution, and temporal variation.

**Refugia** – In a broad sense, refugia are sites to which organisms retreat, persist in, and potentially expand under changing environmental conditions (Keppell et al. 2012)

**Resiliency** – The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

**Restoration** – The process of assisting in the recovery of an ecosystem that has been degraded, damaged, or destroyed (Society for Ecological Restoration International 2004). Ecological restoration focuses on establishing or re-establishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystem sustainability, resilience, and health under current and future conditions. Accordingly, any project or activity that assists in the recovery of a degraded, damaged, or destroyed ecosystem can be considered restoration. Restoration can be active or passive. Treatments that move ecosystem components toward desired conditions are considered restoration as are removal of impacts. Allowing natural processes to move ecosystem components toward desired conditions can also assist in the recovery of an ecosystem. General Technical Report RMRS-GTR-310 provides a framework for restoration of ponderosa pine and mixed conifer with frequent fire (Reynolds et al. 2013).

**Restricted distribution** – Species (or subspecies) that is limited in extent in the Southwest.

**Research natural area (RNA)** – Research natural areas are part of a national network of ecological areas designated in perpetuity for research and education and/or to maintain biological diversity on National Forest System lands. Research natural areas are principally for nonmanipulative research, observation, and study. They also may assist in implementing provisions of special acts, such as the Endangered Species Act of 1973 and the monitoring provisions of the National Forest Management Act of 1976. (FSM 4063.05).

**Riparian** – An area of vegetation adjacent to an aquatic ecosystem distinguished by a high water table, certain soil characteristics, and some vegetation that requires free water or conditions that are more moist than normal.

**Road** – A motor vehicle route over 50 inches wide, unless identified and managed as a trail (36 CFR 212.1, FSM 7705).

**Road decommission** – Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7705—Transportation System, USDA 2003). FSM 7712.11- Exhibit 01 identifies five levels of treatments for road decommissioning which can achieve the intent of the definition. These include blocking the entrance, revegetation, waterbarring, removing fills and culverts, establishing drainageways and removing unstable road shoulders, and full obliteration, recontouring, and restoring natural slopes.

**Roadway** – Portion of the road that includes everything from the top of the cut slope to the bottom of the fill slope.

**Salable minerals** – Minerals that are relatively low value per volume; for example: sand, gravel, cinders, common building stone, and flagstone. Many of the materials are used for road surfacing, boulders, and engineering construction or may be specialty resources such as soil amendments or decorative stone, including flagstone. These minerals are typically sold unless used internally, by another government agency, or for ceremonial uses. In these cases, they may be provided free of charge.

**Scales** – The aerial extent of certain plan decisions are described at various scales:

- **Fine scale** is an area of about 10 acres or less at which the distribution of species is described.

- **Mid-scale** is an area of 100 to 1,000 acres composed of assemblages of grouped and individual species which have similar biophysical conditions. An area at this scale is composed of 10 or more fine-scale units.
- **Landscape scale** is a unit of forest land approximately 10,000 acres or greater, typically composed of variable elevations, slopes, aspects, soils, plant associations, and natural ecological processes. An area at this scale is composed of 10 or more mid-scale units.

**Scenery** – General appearance of a place, landscape, and/or its visible features (USDA Forest Service 2000).

**Scenic integrity** – A measure of the degree to which a landscape is visually perceived to be “complete” and is determined by three factors: dominance, degree of deviation, and intactness of the desired landscape character; it is established based on the existing condition. Scenic integrity disturbances most typically result from human activities but can also result from natural events which exceed the landscape’s historic range of variability (HRV) in terms of magnitude, duration, or intensity. An exception to this is direct human alterations that have become accepted over time as positive landscape character attributes (such as historic cabins, farms, and ranches).

- **Very High Integrity** – The valued scenery appears natural and unaltered. These areas generally provide for ecological change only. When used as a standard or guideline, this level should be achieved as soon after project completion as possible or within 3 years maximum.
- **High Integrity** – The valued scenery “appears natural or unaltered,” yet visual disturbances are present; however, they remain unnoticed because they repeat the form, line, color, texture, pattern, and scale of the valued scenery. When used as a standard or guideline, this level should be achieved as soon after project completion as possible or within 3 years maximum.
- **Moderate Integrity** – The valued scenery “appears slightly altered.” Noticeable disturbances are minor and visually subordinate to the valued scenery because they repeat its form, line, color, texture, pattern, and scale. When used as a standard or guideline, this level should be achieved as soon after project completion as possible or within 3 years maximum.
- **Low Integrity** – The valued scenery “appears moderately altered.” Visual disturbances are codominant with the valued scenery and may create a focal point of moderate contrast.
- **Very Low Integrity** – The scenery shows obvious human activities of vegetative and landform alterations which dominate the natural landscape but should appear as natural occurrences when viewed at background distances.

**Scenic integrity objectives (SIO)** – The state of naturalness, or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest (USDA Forest Service 2000).

**Scenic quality** – Degree to which the appearance of a place, landscape, or feature can elicit psychological and physiological benefits to individuals and, therefore, to society in general (definition per Scenery Management System Handbook Glossary, revised date). See also definition for Landscape character.



**Sensitive resources** – Resources such as riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of threatened, endangered, or Southwestern Region sensitive species.

**Seral stage** – The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage.

**Significant cave** – A cave located on National Forest System lands that has been evaluated and shown to possess features, characteristics, values, or opportunities in one or more of the following resource areas: biota; cultural; geologic-mineralogic-paleontologic; hydrologic; recreational; or educational-scientific for scientific, educational, or recreational purposes; and which has been designated “significant” by the forest supervisor (National Cave Resources Management and Protection Act, P.L. 100-691 and 36 CFR 290.3).

**Site potential** – For a given potential vegetation type, site potential represents the successional condition with the greatest representation of late-seral vegetation that is typical under characteristic, pre-settlement levels of fire and herbivory. The existing vegetation of such a plant community would have 100 percent similarity to site potential when computing ecological status (FSH 2090.11), and would be at reference condition. Site potential is relative to the potential vegetation type.

**Smoke sensitive areas** – Areas in which smoke from outside sources is intolerable for reasons such as heavy population, existing air pollution, or intensive recreation or tourist use.

**Snag** – A standing dead or a declining, partially dead tree. Often is top killed, lightning or fire-scarred, cracked, missing many or all limbs, missing some or all of the bark, and may contain cavities. Snags provide essential wildlife habitat for many species and are important for forest ecosystem function.

**Soil compaction** – Soil compaction occurs when soil particles are pressed together, reducing the pore space between them. This increases the weight of solids per unit volume of soil (bulk density). Soil compaction occurs in response to pressure (weight per unit area) exerted by field machinery or animals. The risk for compaction is greatest when soils are wet.

**Soil condition classes** – There are four types of soil condition classes: satisfactory, impaired, unsatisfactory, and inherently unstable.

- **Satisfactory** – Indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of the soil to maintain resource values and sustain outputs is high.
- **Impaired** – Indicators signify a reduction in soil function. The ability of the soil to function properly and normally has been reduced and/or there exists an increased vulnerability to degradation. An impaired category indicates there is a need to investigate the ecosystem to determine the cause and degree of decline in soil functions. Changes in land management practices or other preventative measures may be appropriate.
- **Unsatisfactory** – Indicators signify that a loss of soil function has occurred. Degradation of vital soil functions result in the inability of the soil to maintain resource values, sustain outputs, or recover from impacts. Unsatisfactory soils are candidates for improved management practices or restoration designed to recover soil functions.

- **Inherently Unstable** – These soils have natural erosion exceeding tolerable limits. Based on the universal soil loss equation, these soils are eroding faster than they are renewing but are functioning properly and normally.

**Soil productivity** – The capacity of soil to support the growth of specified plants, plant communities, or a sequence of plant communities. Soil productivity may be expressed in terms of volume or weight/unit, area/year, percent plant cover, or other measures of biomass accumulation.

**Special uses** – All use and occupancy on more than a transient basis except those covered by mining laws or associated with harvesting timber or grazing livestock. These uses include roads, all types of utilities, ski areas, cemeteries, electronic sites, and recreation residences. Uses are ordinarily covered by one of two types of permits: either an annual or term permit. Annual permits are for a relatively short-term use and are revocable by the Forest Service. They are renewable each year by the payment of a fee. Term permits are used to cover uses of a longer time period (up to 30 years) and having a large economic investment. Examples of when this permit would be used are large electric transmission lines and large recreation resorts and ski areas.

**Stand** – A group of trees sufficiently uniform in species composition, size, age, structure, spatial arrangement, and condition to be distinguished from surrounding stands and managed as a single unit.

**Streamcourse** – On the Coconino NF, there are three types of streamcourses: ephemeral, intermittent, and perennial. They differ in the timing and duration of waterflow and corresponding vegetation. Ephemeral watercourses flow short term in response to storm events. Intermittent watercourses flow seasonally usually in response to snowmelt. Perennial streamcourses flow year-round except during extended drought, and some of their flows may be below the surface. Watercourses include their associated floodplains

**Structure** (vegetation) – The presence, size, form, density, and physical arrangement of living and dead (snags and logs) vegetation in an ERU. Vertical structure refers to the variety of plant heights, from the canopy to the forest floor. Horizontal structure refers to the types, sizes, and distribution of trees and other plants across the land surface. Forest lands with substantial structural diversity provide a variety of niches for different wildlife species.

**Suspended sediment concentration** – Concentration of suspended solid material in surface waters. Available from <http://water.usgs.gov/osw/pubs/WRIR00-4191.pdf> Accessed April 22, 2015.

**Sustainability** – A goal for economic development and natural resource management. Ecosystem sustainability is the capacity of an ecosystem for long-term maintenance of ecological processes and functions, biological diversity, and productivity. It is also called ecological sustainability, which generally refers to land management practices that provide goods and services from an ecosystem without degradation of the site quality and without a decline in the yield of goods and services over time.

**Terrestrial ecosystem survey** – (Also called terrestrial ecological unit inventory or TEUI.) A classification of ecological types and mapped terrestrial ecological units at a consistent standard throughout National Forest System lands. This information is appropriate for use in land planning and management programs on the Coconino NF to help estimate the impact of selected uses on the environment. Land and water areas are grouped into ecological units based upon similar capabilities inherent in the soil and potentials for response to management and natural

disturbances. Capabilities and potentials derive from multiple elements: climate, geomorphology, geology, soils, water, and potential vegetation (Miller et al. 1995).

**Timber production** – Process of managing stands of trees within the national forest to maximize woody output. This is not a linear process because other factors must be considered, including, but not limited to: marketable and nonmarketable goods, financial benefits, management practices, and the environmental implications of these management practices.

**Total maximum daily load (TMDL)** – Calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, of which portions of that load are allocated among the various sources of that pollutant.

**Trail** – A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail (36 CFR 212.1).

**Travel Management Rule** – Located in 36 CFR 212, Subpart B, Designation of Roads, Trails, and Areas for Motor Vehicle Use. The rule requires each national forest or ranger district to designate those roads, trails, and areas open to motor vehicles. Designation will include class of vehicle and, if appropriate, time of year for motor vehicle use. A given route, for example, could be designated for use by motorcycles, off-highway vehicles, or street-legal vehicles. Once designation is complete, the rule will prohibit motor vehicle use off the designated system or inconsistent with the designations. Designations will be shown on a motor vehicle use map. Use inconsistent with the designations will be prohibited.

**Travertine** – A calcium-rich rock composed primarily of calcium carbonate minerals, which forms by chemical precipitation from certain types of shallow or surface waters such as springs and rivers; a type of limestone.

**Uneven-aged forests** – Forests composed of three or more distinct age classes of trees, either intimately mixed or in small groups.

**Utility corridors** – The linear space needed to bury a produced water line, gas pipeline, oil pipeline, electric line, or other line(s). It is often, but not always, located along a road.

**Utilization** – Proportion or degree of current year's forage production that is consumed or destroyed by animals (including insects). Utilization may refer either to a single plant species, a group of species, or the vegetation as a whole. Utilization is synonymous with use. This process requires a comparison of the amount of herbage left compared with the amount of herbage produced during the year. (Utilization Studies and Residual Measurements; Interagency Technical Reference 1996)

**Vegetative ground cover** – Live plant growth (vegetative basal area) plus dead, unattached organic matter (litter) over an area of ground. It is considered effective when it provides adequate protection from erosion, drought, and other ecological disturbances.

**Water gap** – Refers to a fenced area that allows livestock access to water in a limited area. Livestock use is concentrated in the water gap while adjacent riparian areas and riparian vegetation are excluded. Has been used to balance livestock use and needs of other resources by limiting grazing effects around wetlands, streams, and other water sources.

**Water rights and claims** – Certified water rights are legally recognized water rights that document how much water can be used, for what beneficial use, and by whom. Claimed water

rights are water right claims for use recognized by the Arizona Department of Water Resources pending adjudication by the court that will decree how much water can be used, for what beneficial use, and by whom.

**Water quality categories –**

- **Category 5 (Impaired)** – Those waters on the State of Arizona impaired waters list (the 303d List) which are characterized by the most severe water quality problems. These waters are then scheduled for total maximum daily load (TMDL) assessments. There are strict discharge permit requirements to assure that any new discharges or modifications will not further degrade water quality.
- **Category 4 (Not Attaining)** – Those waters where designated use is not attaining State water quality standards, there have been past water quality impairments, and there are current TMDL plans aimed at improving water quality.
- **Category 3 (Inconclusive)** – Those waters where all designated uses are inconclusive. Also, any surface water not assessed due to lack of credible data may be included.
- **Category 2 (Attaining Some Uses)** – Those waters where at least one designated use has been assessed as attaining and all other uses have been assessed as inconclusive.
- **Category 1 (Attaining All Uses)** – All designated uses assessed as attaining.

**Wild and Scenic River (WSR)** – A river that is free-flowing and has at least one outstandingly remarkable value. Eligible and suitable rivers are given a tentative classification of wild, scenic, or recreational. These rivers may be included in the National Wild and Scenic Rivers System.

- **Wild** – Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- **Scenic** – Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- **Recreational** – Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

**Wilderness area** – An area of undeveloped Federal land that Congress designated as wilderness and that retains its primeval character and influence, without permanent improvements or human habitation, and is protected and managed to present its natural conditions. An area that (1) generally appears to have been affected primarily by the forces of nature, with the imprint of people's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) comprises at least 5,000 acres of land or is of sufficient size to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value (Wilderness Act of 1964, P.L. 88-577).

**Wilderness Opportunity Spectrum** – Based on the same concept and management framework of the recreation opportunity spectrum (ROS). The settings, activities, and opportunities provided for within the wilderness opportunity spectrum describe the variations in degree of isolation from the sounds and influences of people and the amount of recreation visitor use. There are four wilderness opportunity spectrum classes: pristine, primitive, semiprimitive, and transition.

- **Pristine** – The area is characterized as an extensive, unmodified, natural environment. Natural processes and conditions have not been measurably affected by the actions of users. The area will be managed as free as possible from the influences of human activity. Terrain and vegetation allow for extensive and challenging cross-country travel.
- **Primitive** – The area is characterized by an essentially unmodified, natural environment. Concentrations of visitors are low and evidence of human use is minimal. The area has high opportunity for isolation, solitude, exploration, risk, and challenge.
- **Semiprimitive** – The area is characterized by a predominantly unmodified environment of at least moderate size. System trails and campsites are present and there is evidence of other uses. A minimum of onsite controls and restrictions are implemented to protect physical, biological, and social resources. Some facilities may be present to reduce visitor impact.
- **Transition** – The area is characterized by a predominantly unmodified environment; however, the concentrations of visitors may be moderate to high at various times. The area is characterized as having a large number of day users who are often mixed with overnight and long-distance travelers on trails near trailheads and wilderness boundaries.

**Wildfire** – Any unplanned ignition of vegetative fuels which can be human-caused, naturally caused (such as lightning-caused), or caused by prescribed fires that are declared wildfires. Every wildfire contains protection objectives that address firefighter and public safety and the protection of values (such as natural, cultural, infrastructure). When the land management plan allows, naturally ignited wildfires may include additional resource objectives that help move ecosystems toward desired conditions. These are sometimes referred to as wildfires managed for resource objectives.

Objectives for wildfires may be developed based on fuel conditions, current and expected weather, current and expected fire behavior, topography, resource availability, and values at risk. Wildfires may be concurrently managed for one or more objectives. Objectives can change as the fire spreads across the landscape; parts of a fire may be managed to meet protection objectives, while other parts are managed to maintain or enhance resources. Site-specific analysis is conducted for prescribed fires and for any wildfire that extends beyond initial attack. For prescribed burns, the decision document is the signed NEPA decision. For wildfires, a Wildland Fire Decision Support System analysis is performed, and signed by the appropriate line officer.

**Wildland-urban interface (WUI)** – Includes those areas of resident populations at imminent risk from wildfire and human developments having special significance. These areas may include critical communications sites, critical sites for water supply, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.

**Wildlife corridors** – A link of wildlife habitat, generally native vegetation, which joins two or more larger areas of similar wildlife habitat or habitat needed seasonally (such as summer and winter range). Corridors are critical for the maintenance of ecological processes including allowing for the movement of animals and the continuation of viable populations. By providing landscape connections between larger areas of habitat, corridors enable migration, colonization, and interbreeding of plants and animals. Corridors can consist of a sequence of stepping stones across the landscape (discontinuous areas of habitat such as wetlands and roadside vegetation),

continuous linear strips of vegetation and habitat (such as riparian strips, drainages, ridge lines, etc.), or they may be parts of a larger habitat area selected for its known or likely importance to local fauna. Wildlife corridors may also connect wildlife populations separated by human activities or structures (such as roads or development).

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# Appendix A. Maps

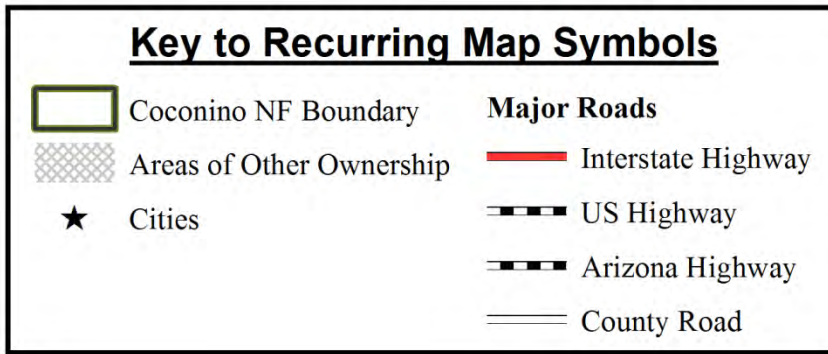
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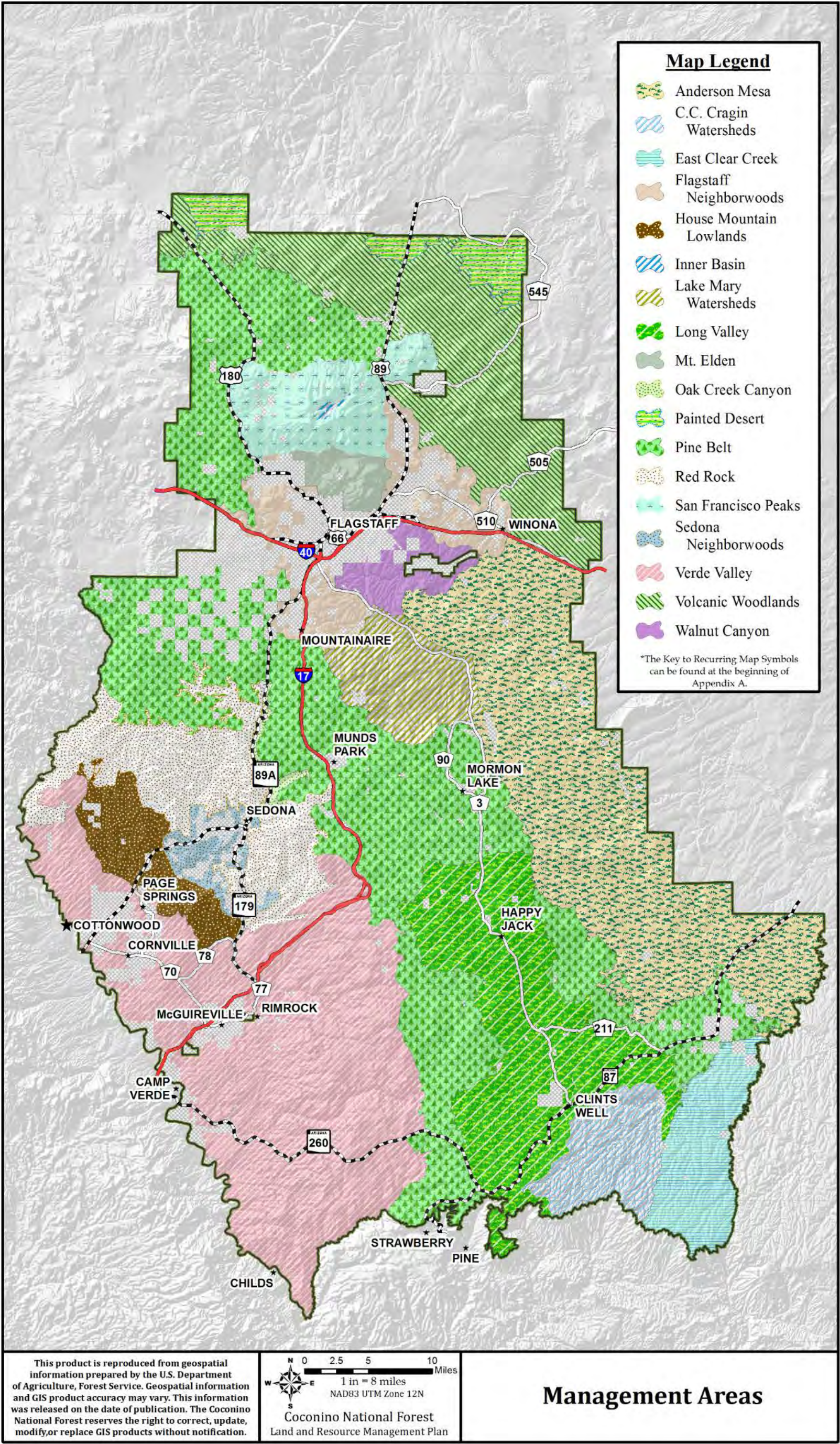
Maps identifying Terrestrial Ecosystem Response Units (ERUs) and Riparian Areas are provided at a coarse scale. Given the variability of the landscape, in instances where the mapped Terrestrial Ecosystem Response Units (ERUs) and Riparian Areas do not correspond to the vegetation type of a given area, management activities are to be governed by the plan components from the descriptions for Terrestrial ERUs and Riparian Areas that most accurately depict the on-the-ground vegetation type.

Maps displaying the desired Recreation Opportunity Spectrum (ROS) and desired Scenic Integrity Objectives (SIO) are provided at the landscape scale. These boundaries are to be used as a framework for management activities and may require flexibility at the ground level to address site-specific conditions and anomalies that are not exact matches with the specific ROS or SIO designation. These types of situations may require field expertise and judgment to identify an area's ROS or SIO designation and may need to be adjusted to meet site-specific conditions.

**For printing:** Maps 1 to 4 are formatted to be printed on paper sized at 11 x 17 inches. For printers limited to sheets sized at 8½ x 11 inches, the appropriate settings (e.g., “Fit to Page”) will need to be adjusted to ensure that these maps are plotted successfully to your printer.

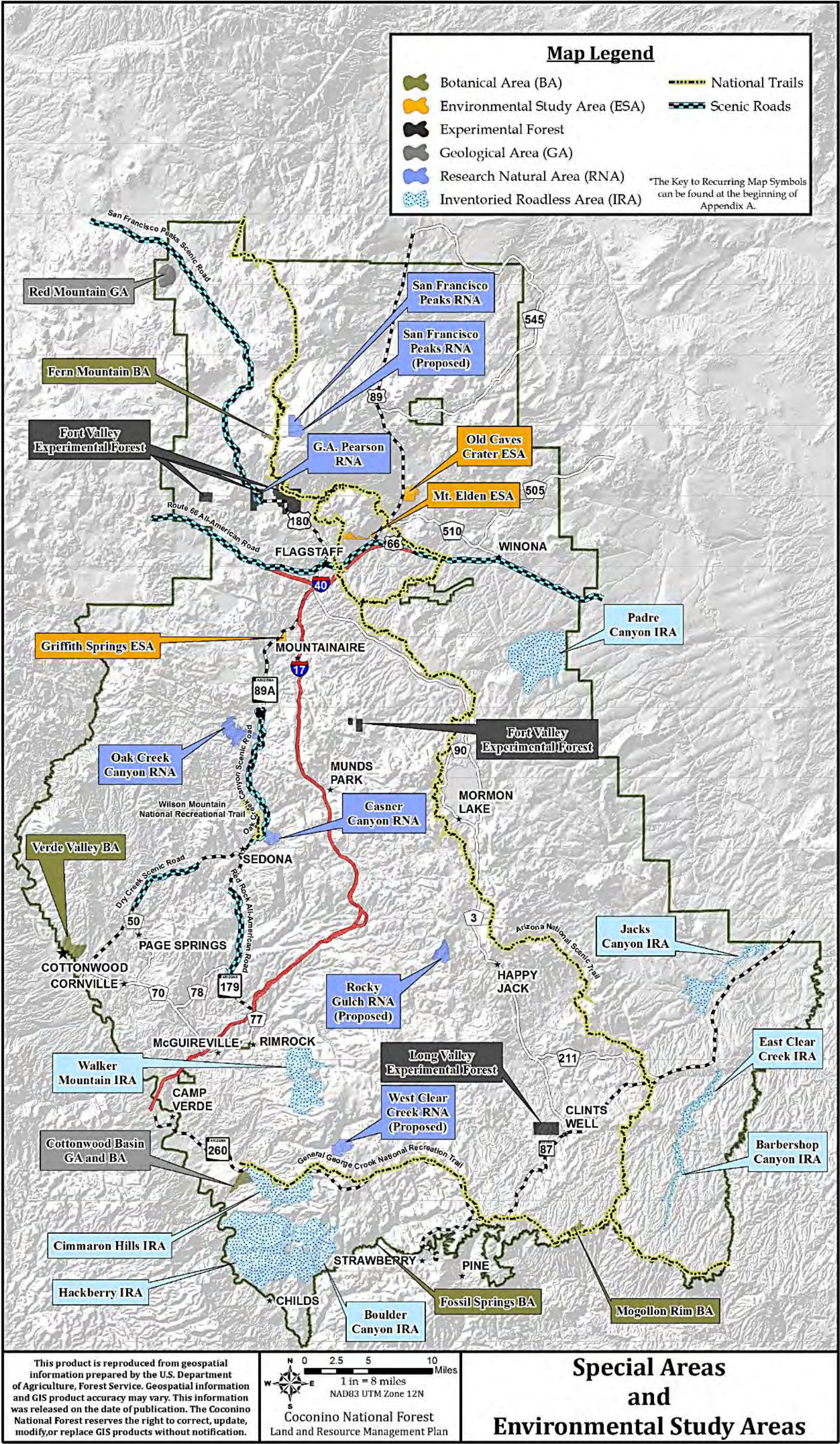






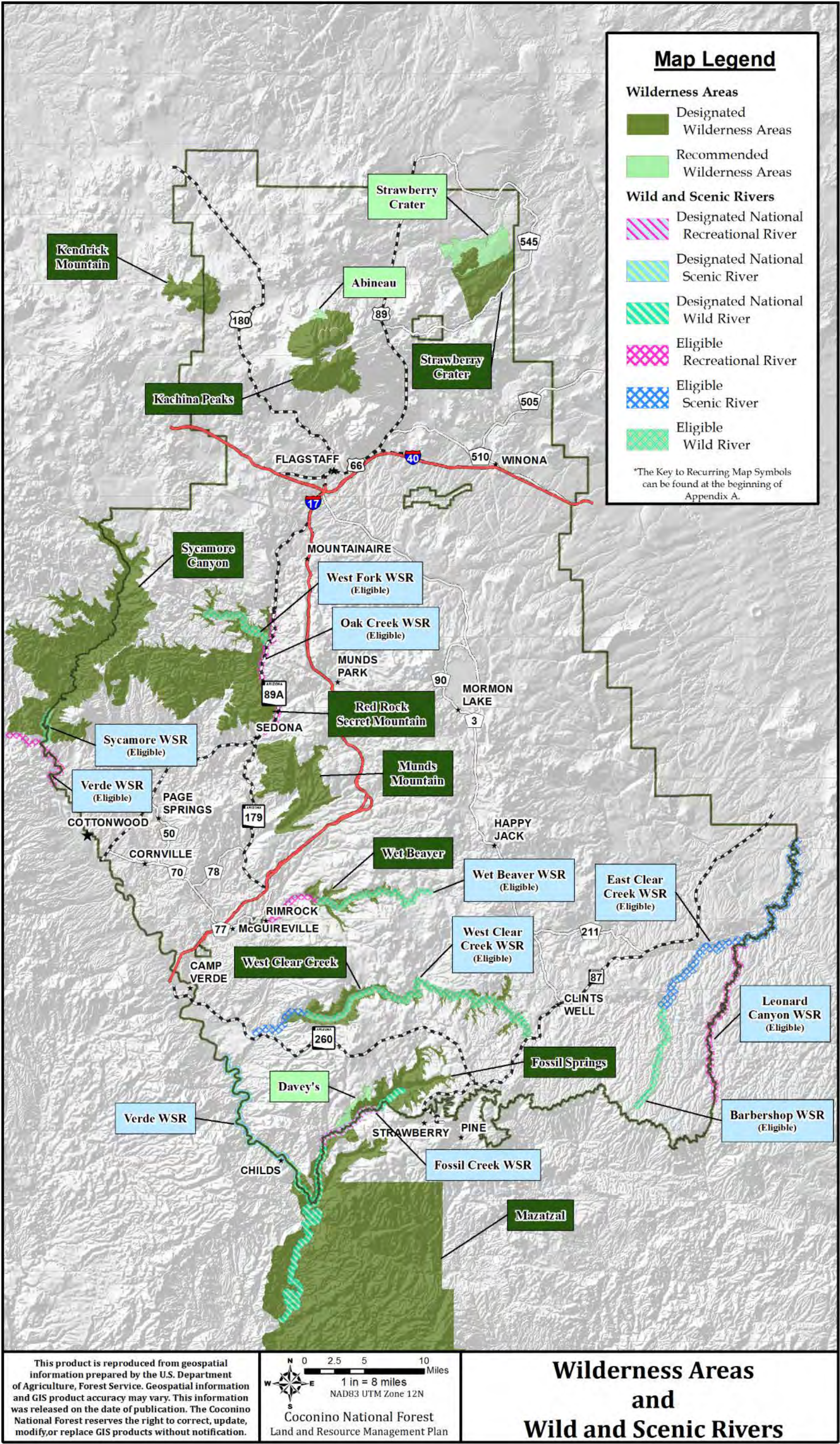
Map 1. Management Areas





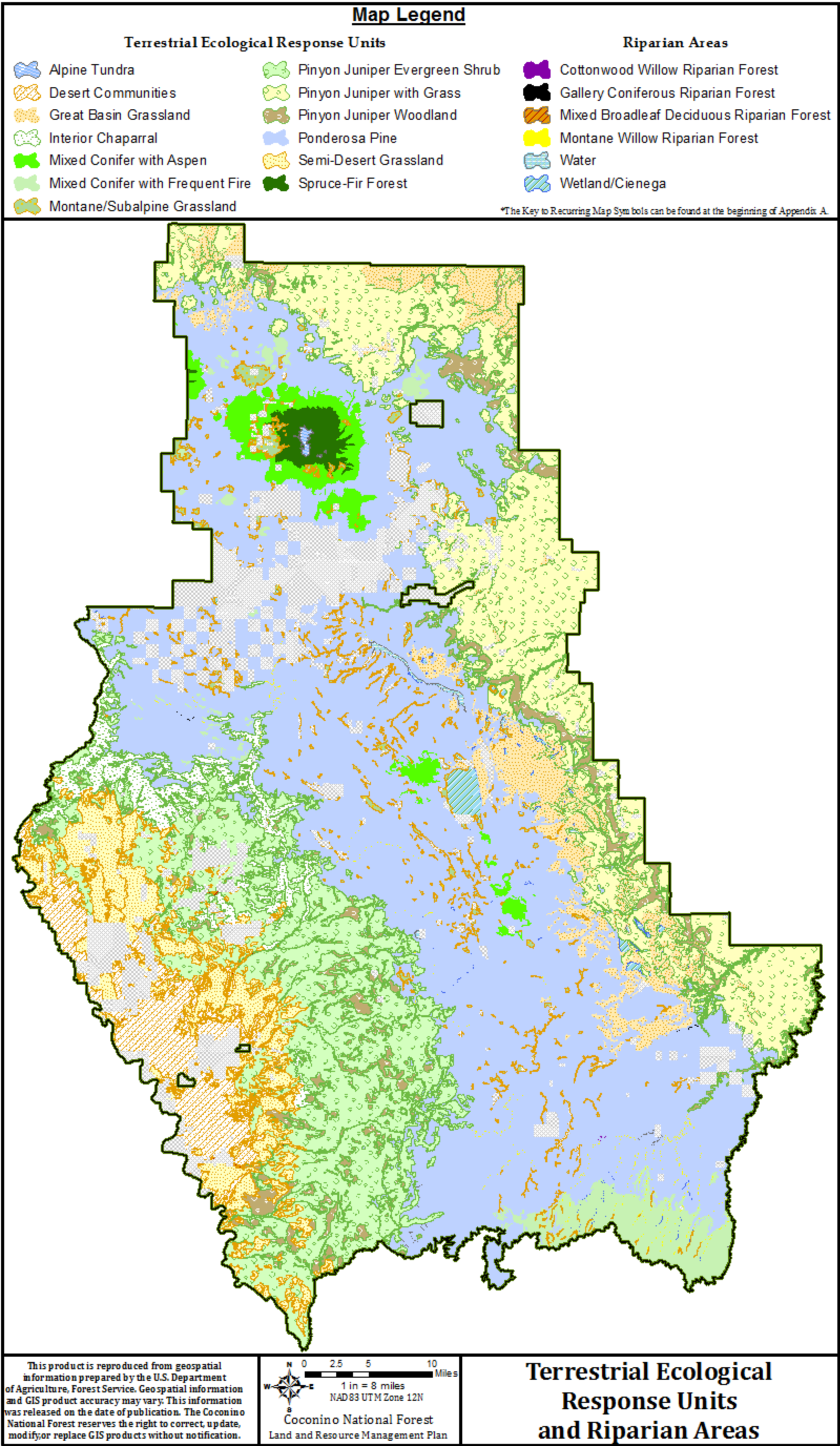
Map 2. Special Areas and Environmental Study Areas



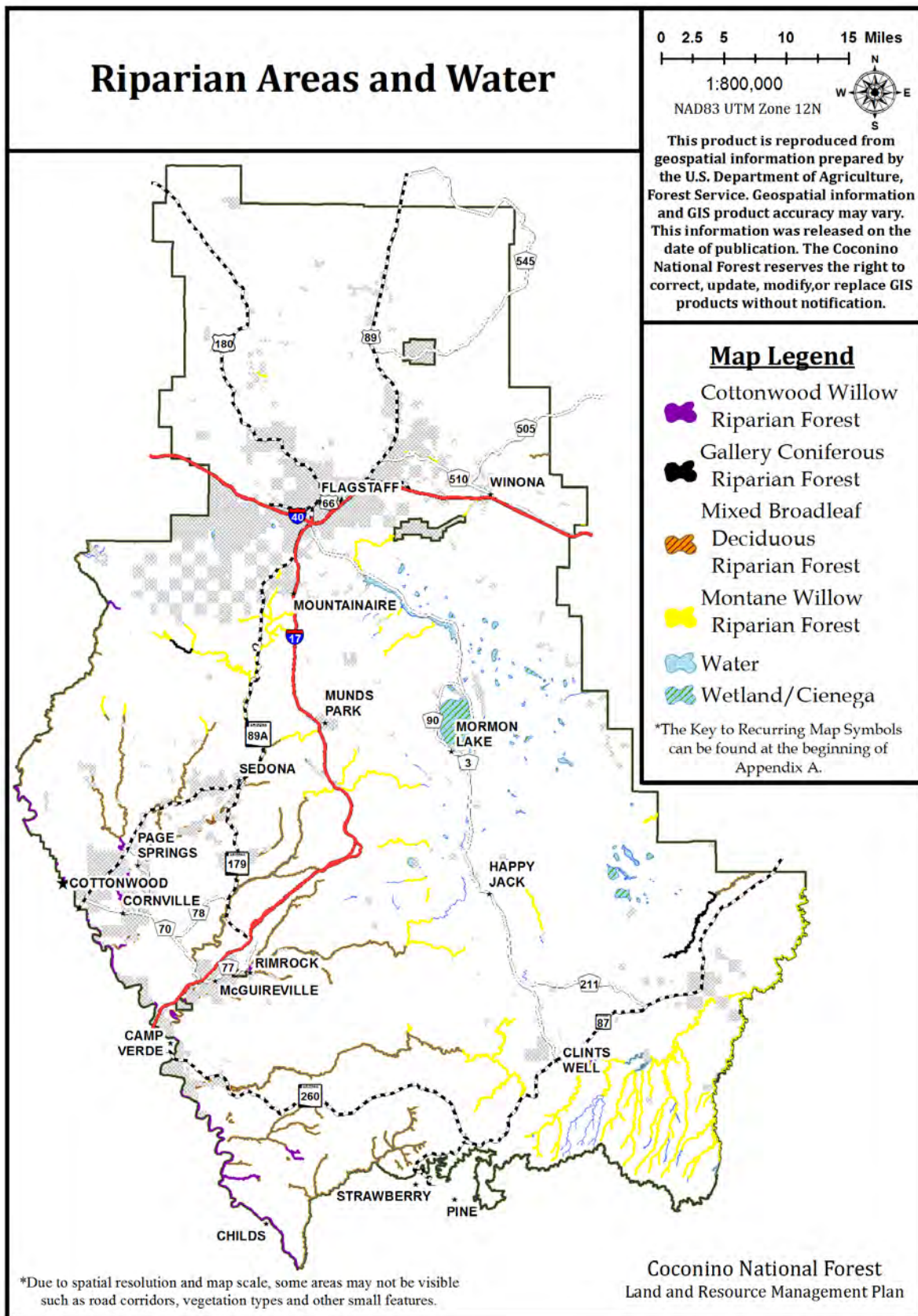


Map 3. Wilderness Areas and Wild and Scenic Rivers

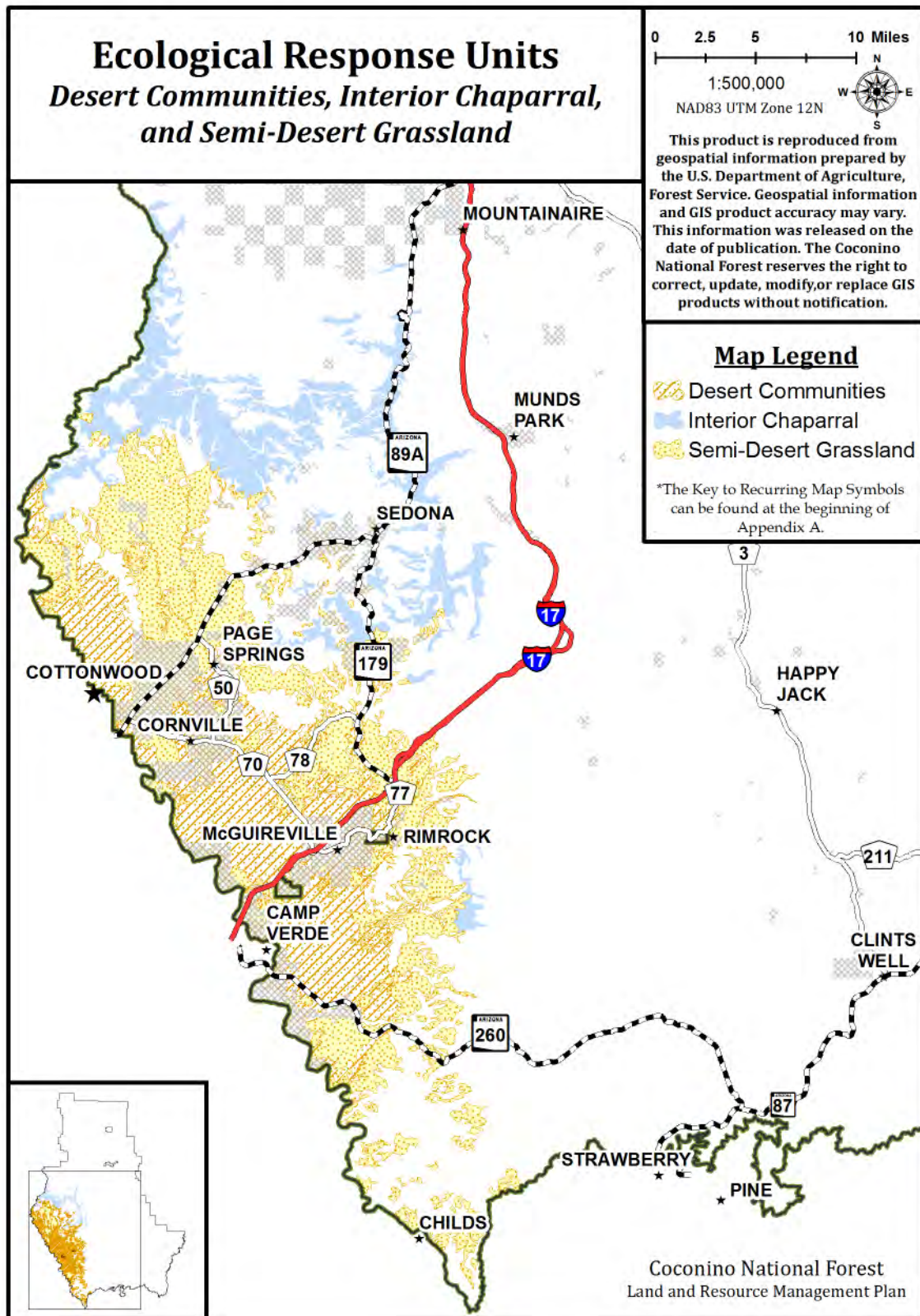






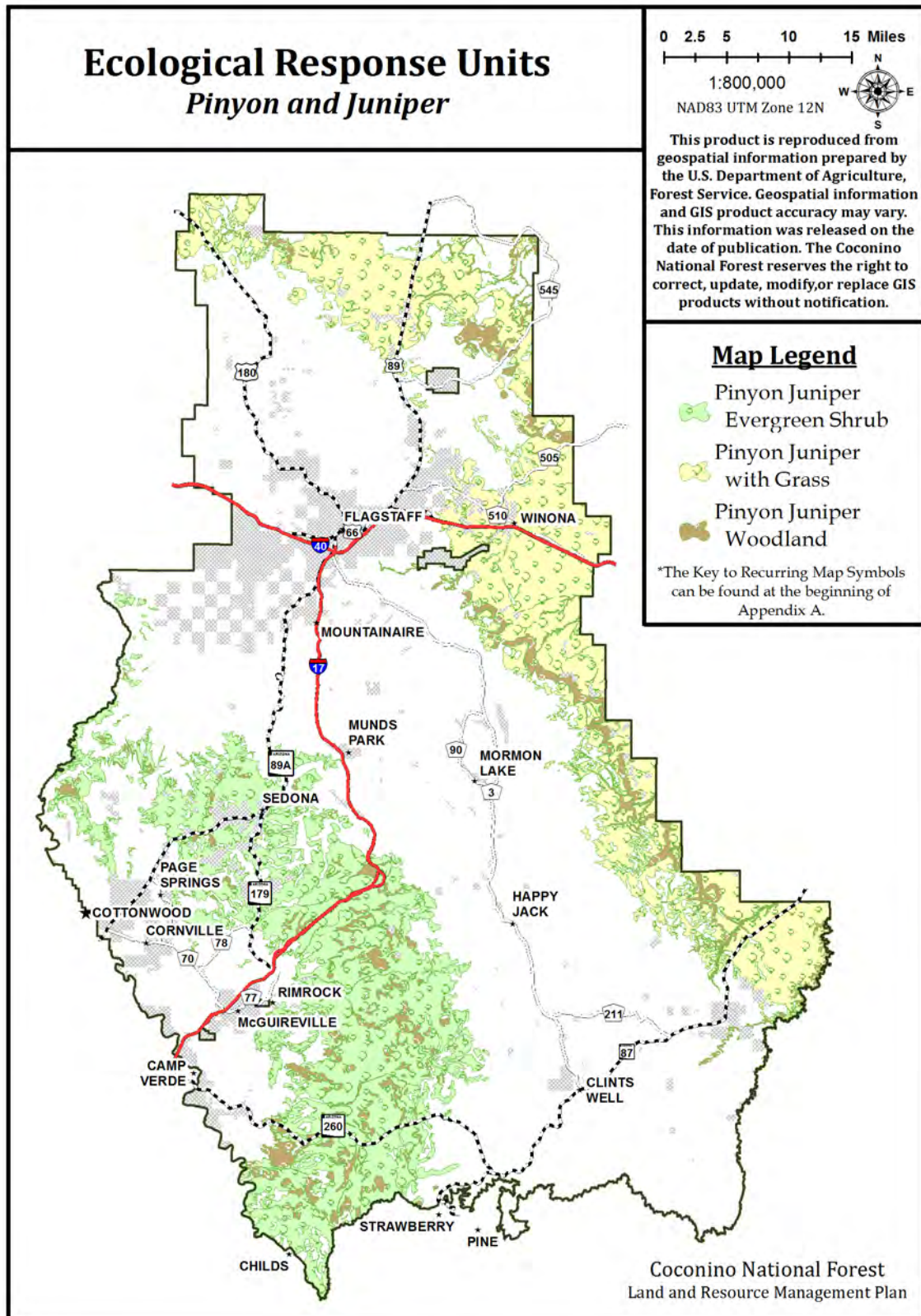


Map 5. Riparian Areas and Water

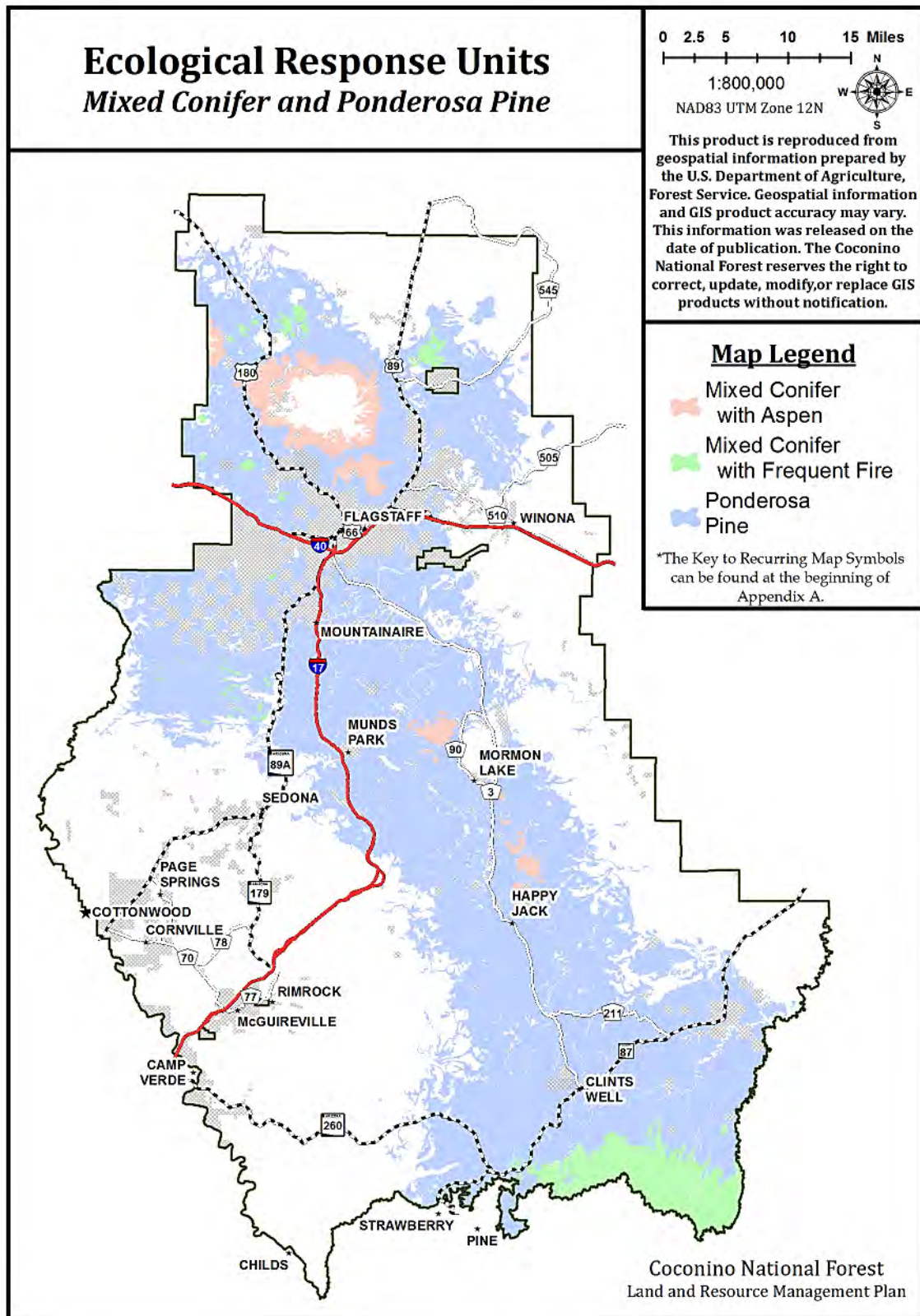


Map 6. ERUs – Desert Communities, Interior Chaparral, and Semi-Desert Grasslands





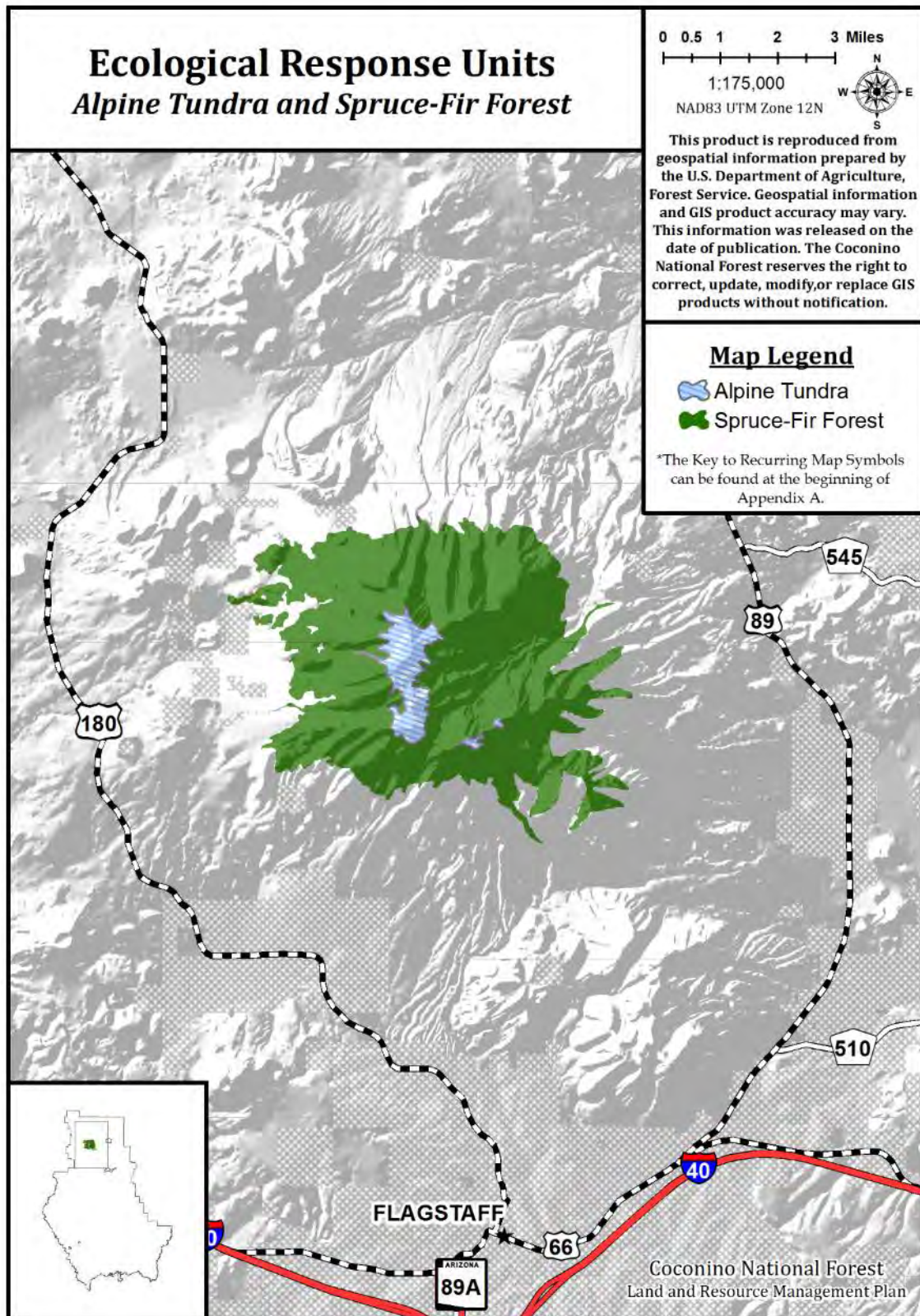
Map 7. ERUs – Pinyon and Juniper



**Map 8. ERUs – Mixed Conifer and Ponderosa Pine**

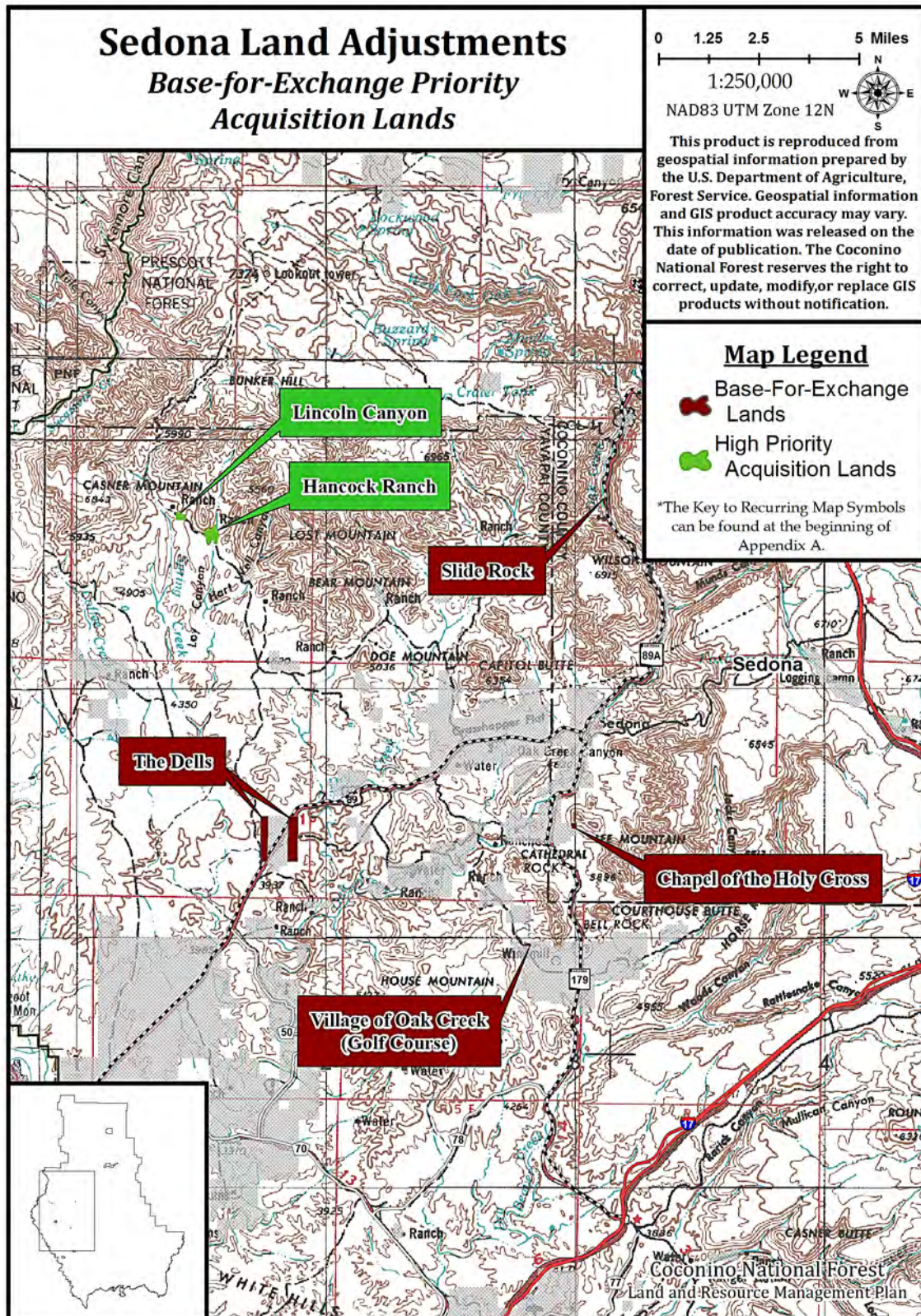






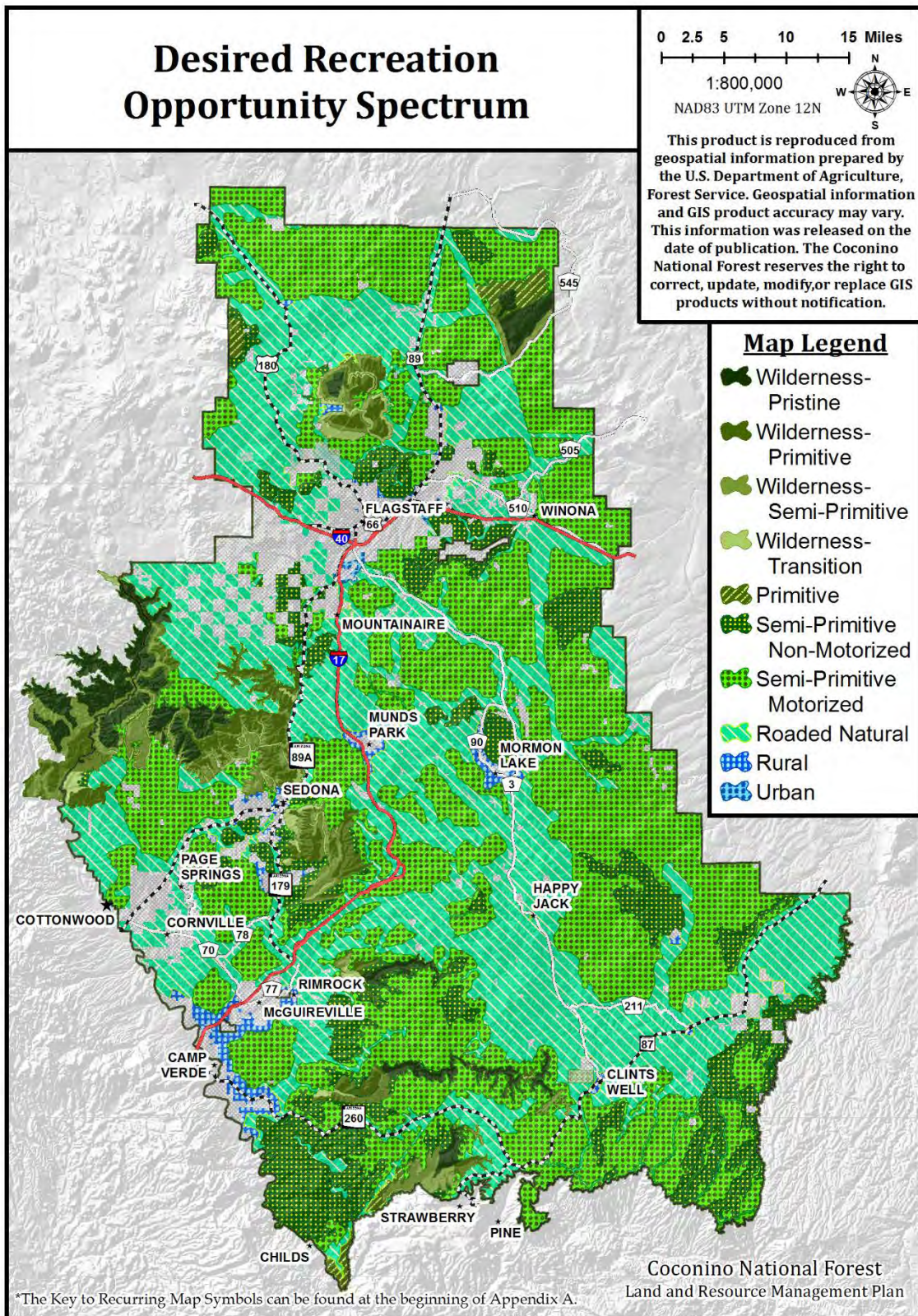
Map 10. ERUs – Alpine Tundra and Spruce-Fir Forest





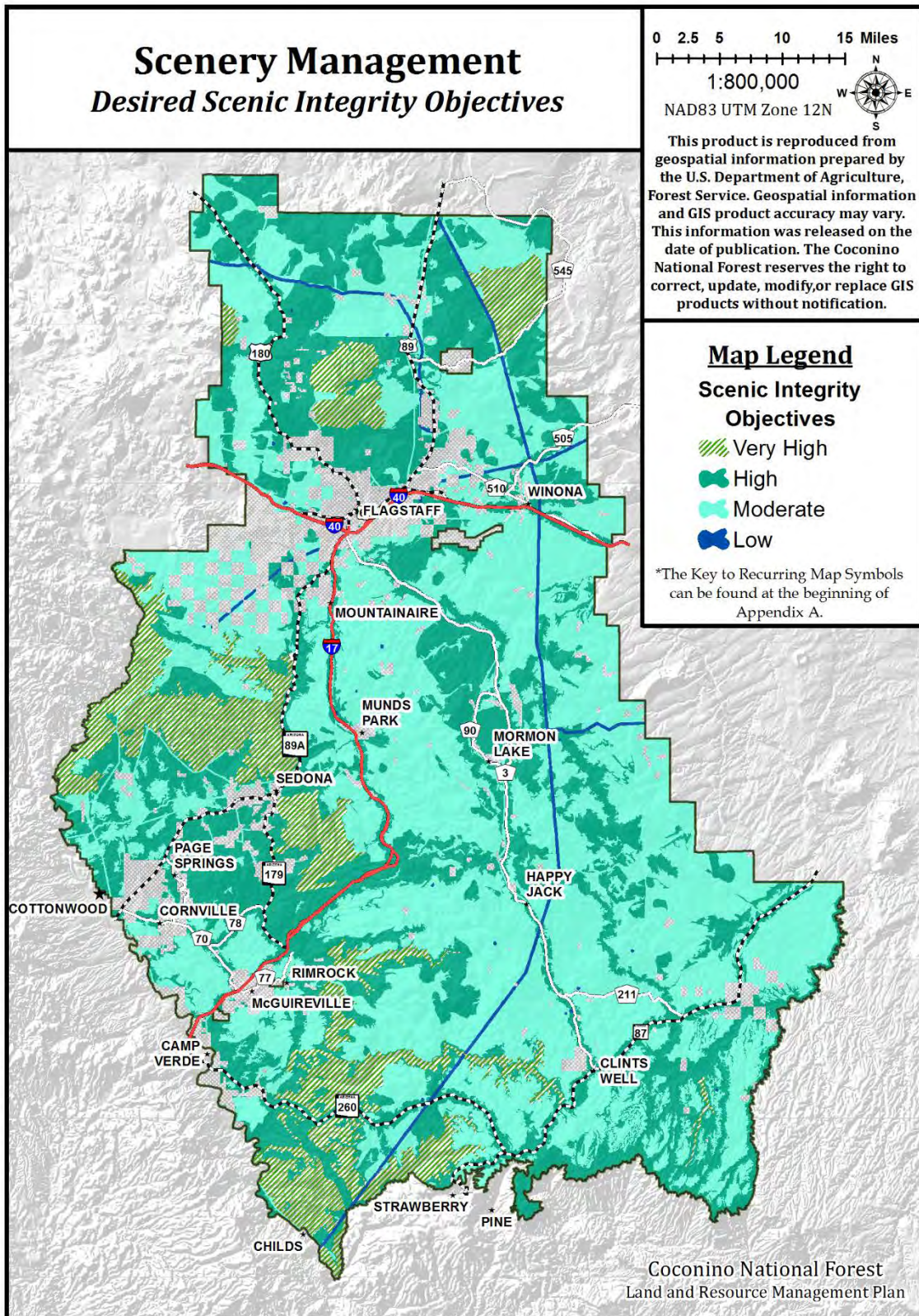
Map 11. Sedona Land Adjustments – Base-for-Exchange Priority Acquisition Lands





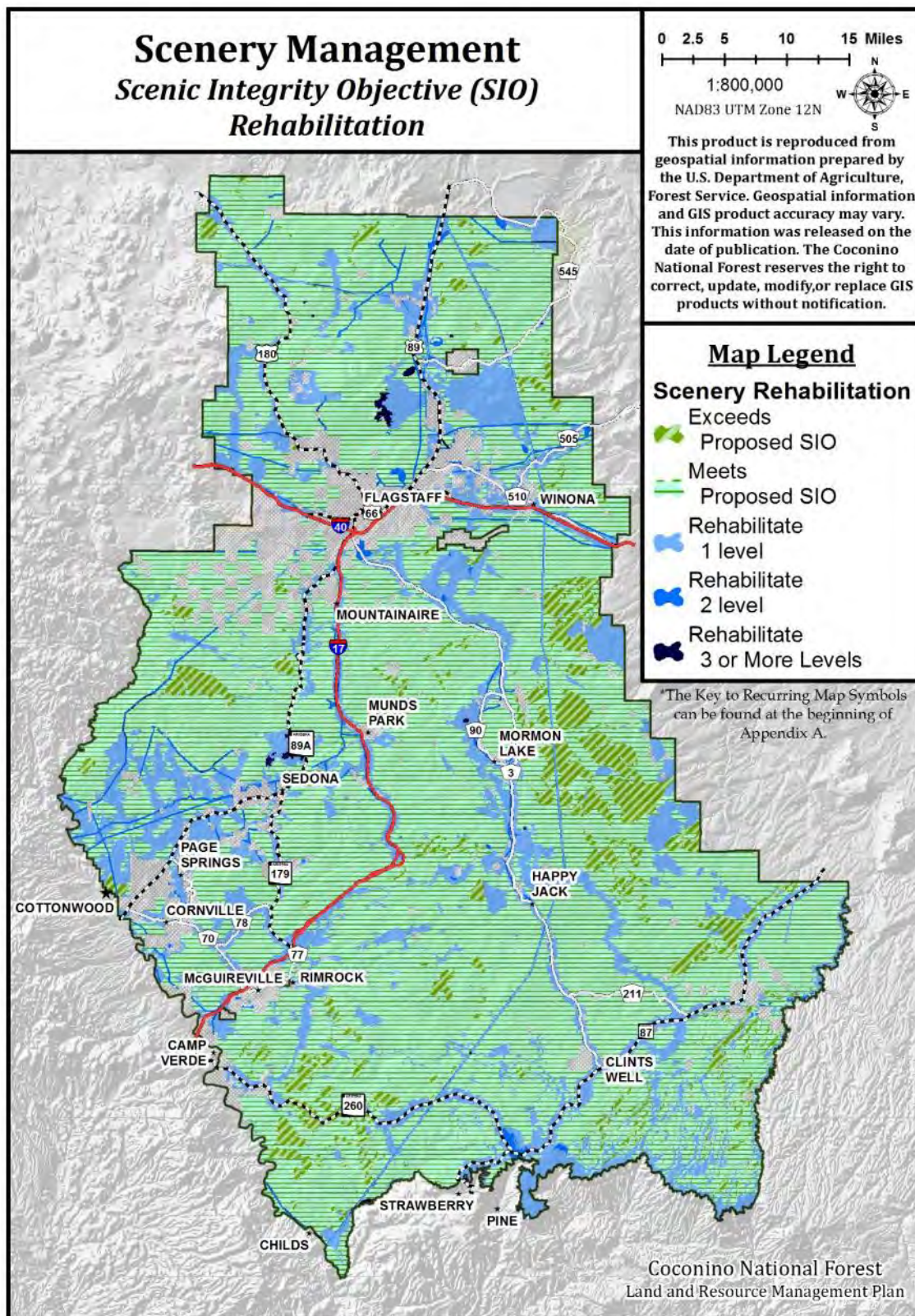
**Map 12. Desired Recreation Opportunity Spectrum**





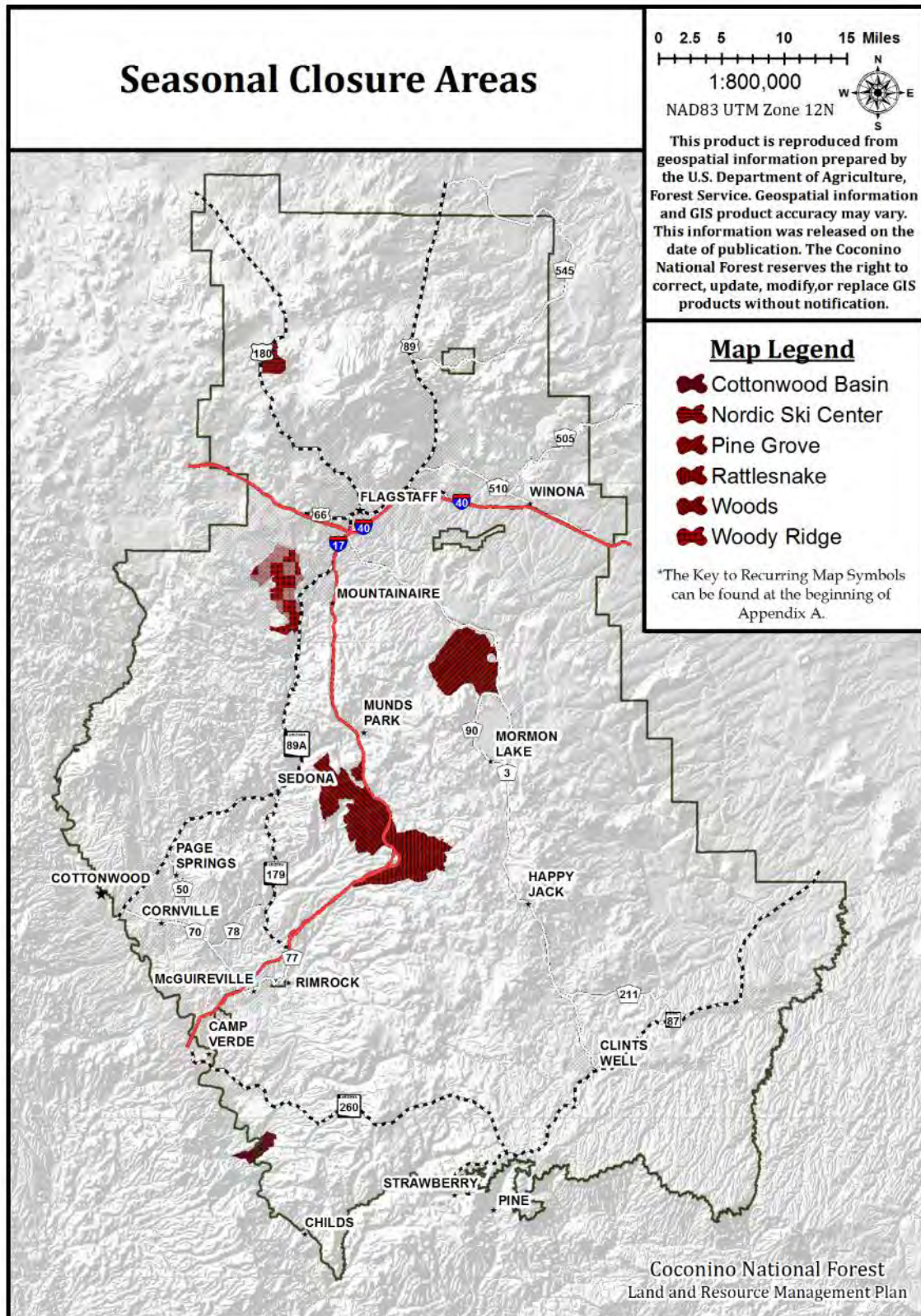
Map 13. Scenery Management – Desired Scenic Integrity Objectives





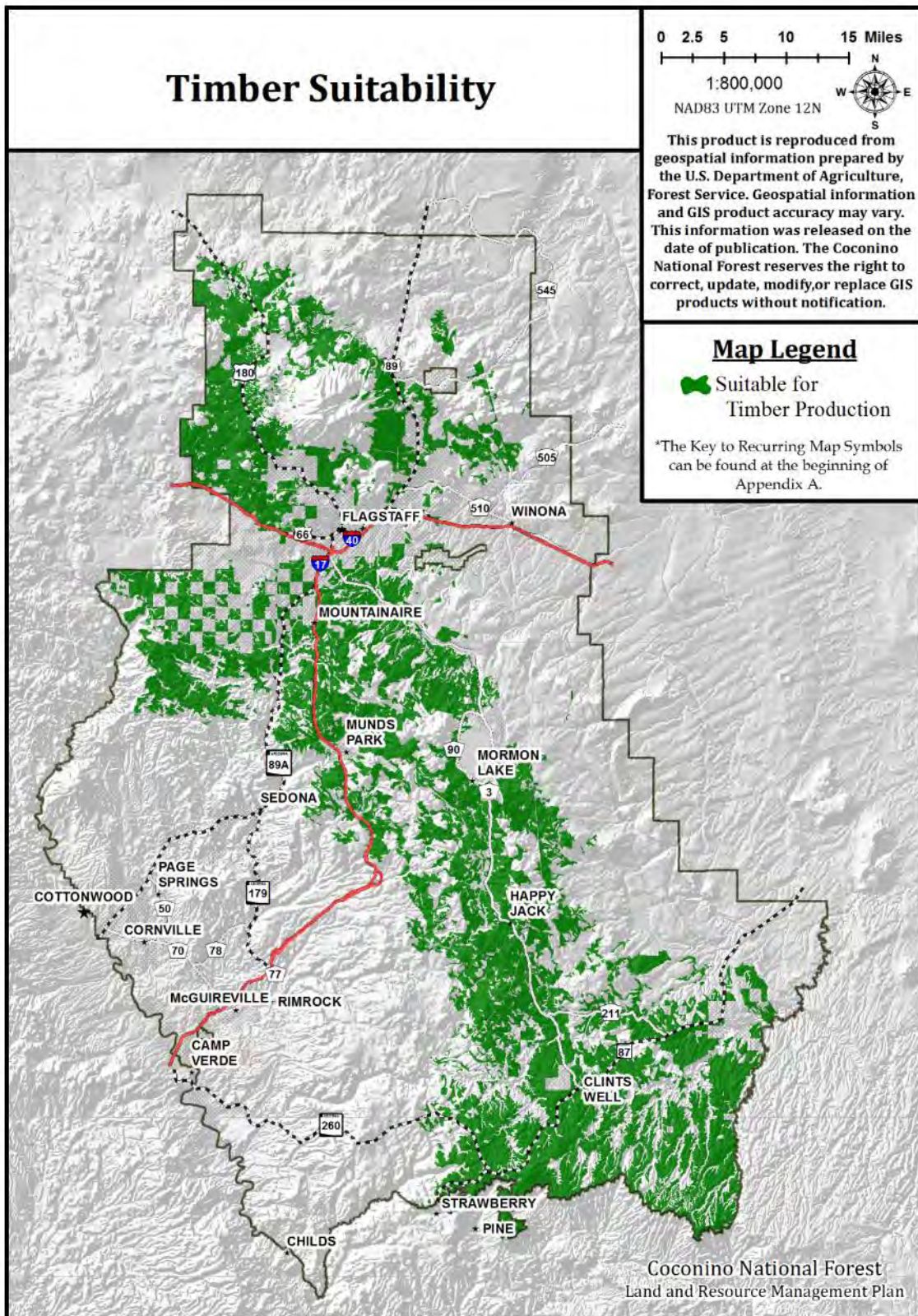
Map 14. Scenery Management – Scenic Integrity Objectives Rehabilitation





Map 15. Seasonal Closures



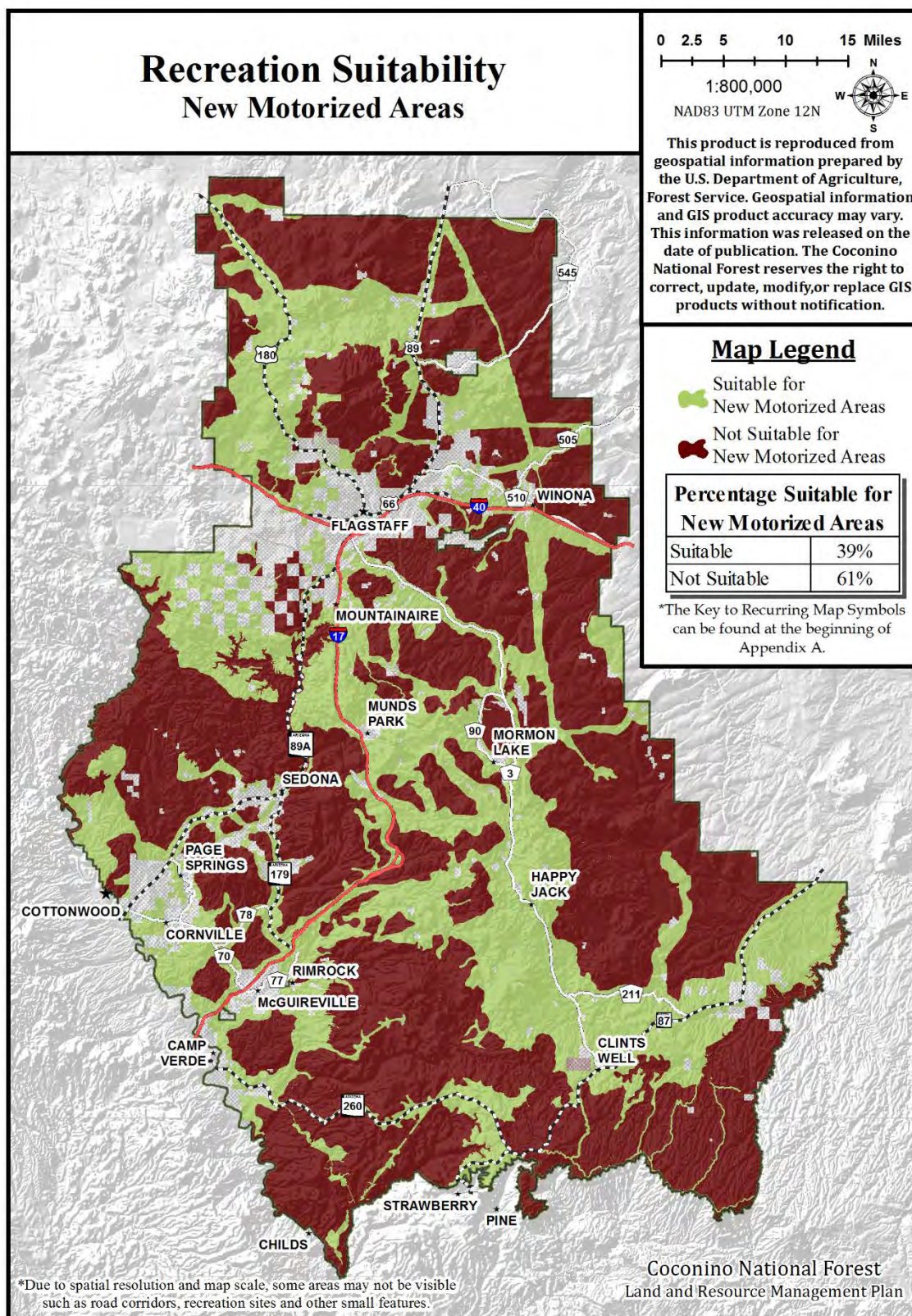


Map 16. Timber Suitability



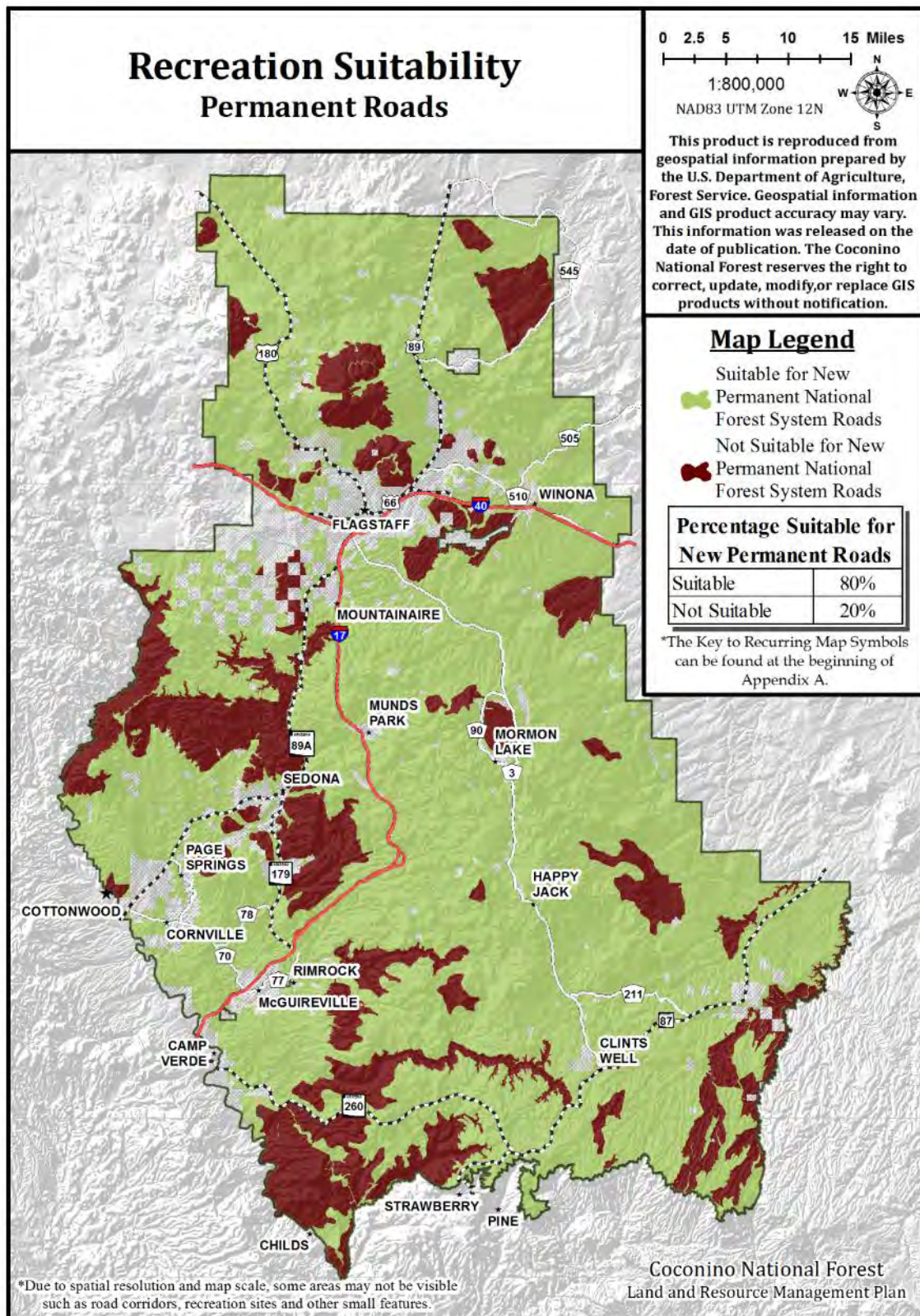






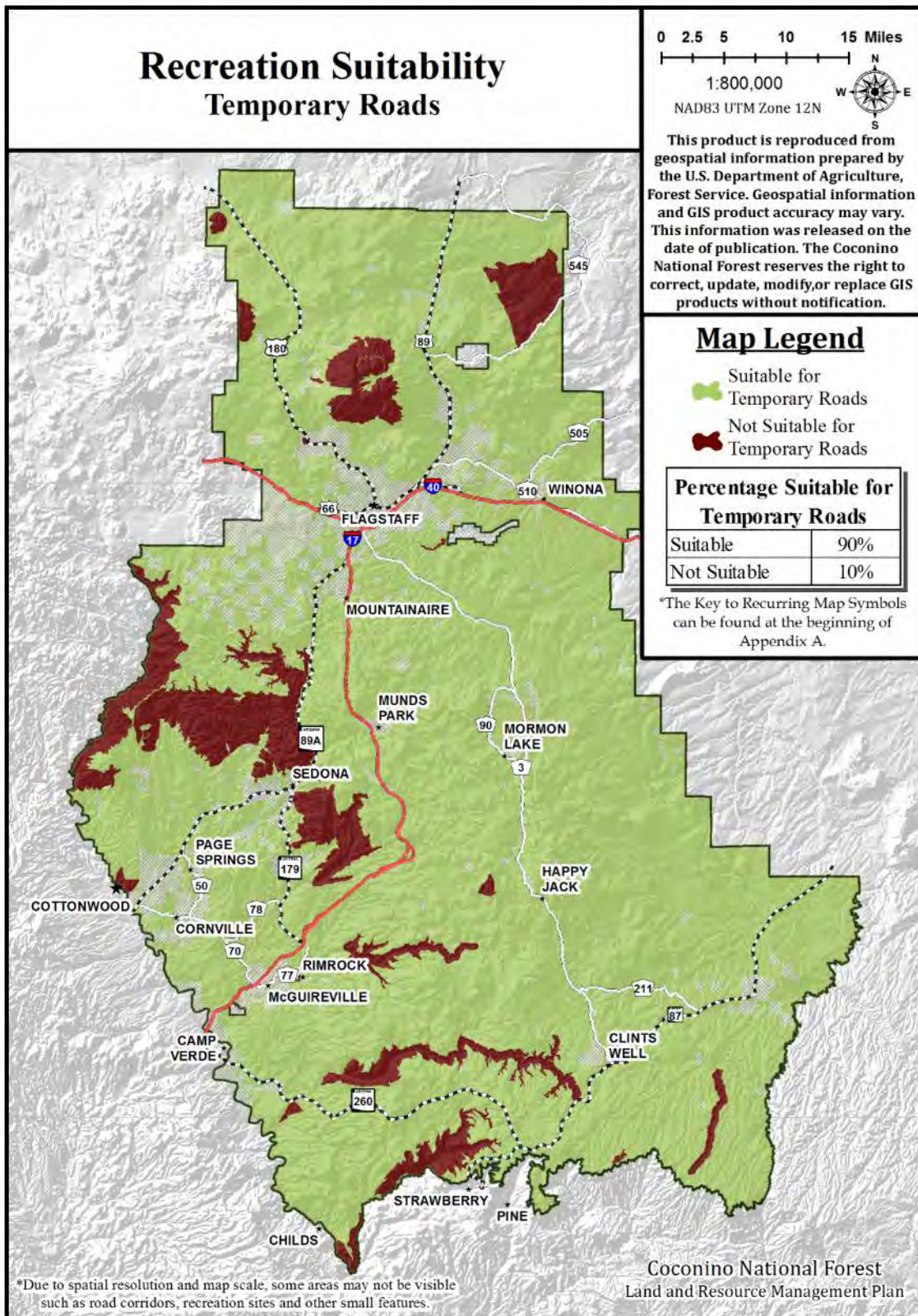
**Map 18. Recreation Suitability: New Motorized Areas**





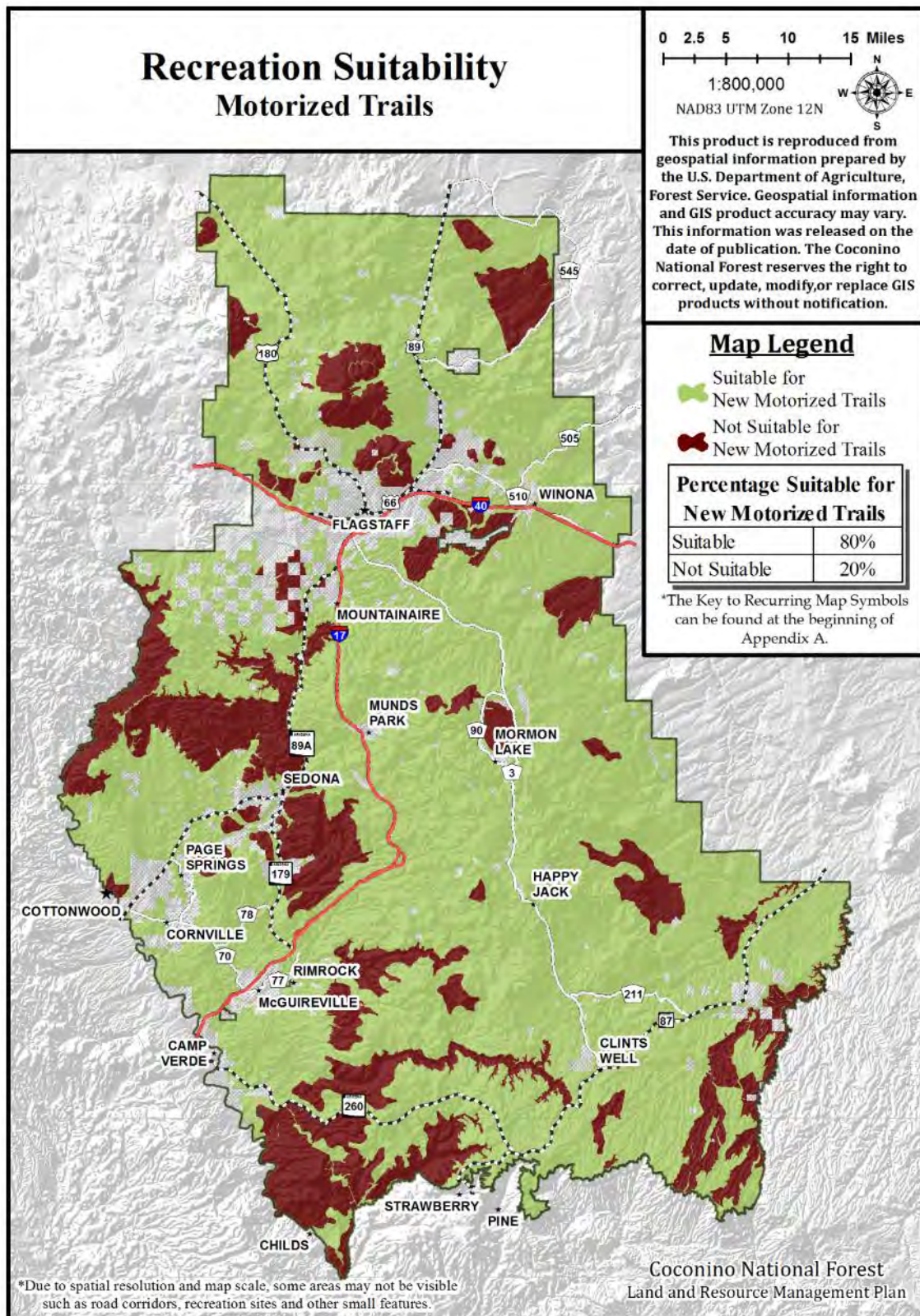
Map 19. Recreation Suitability: Permanent Roads





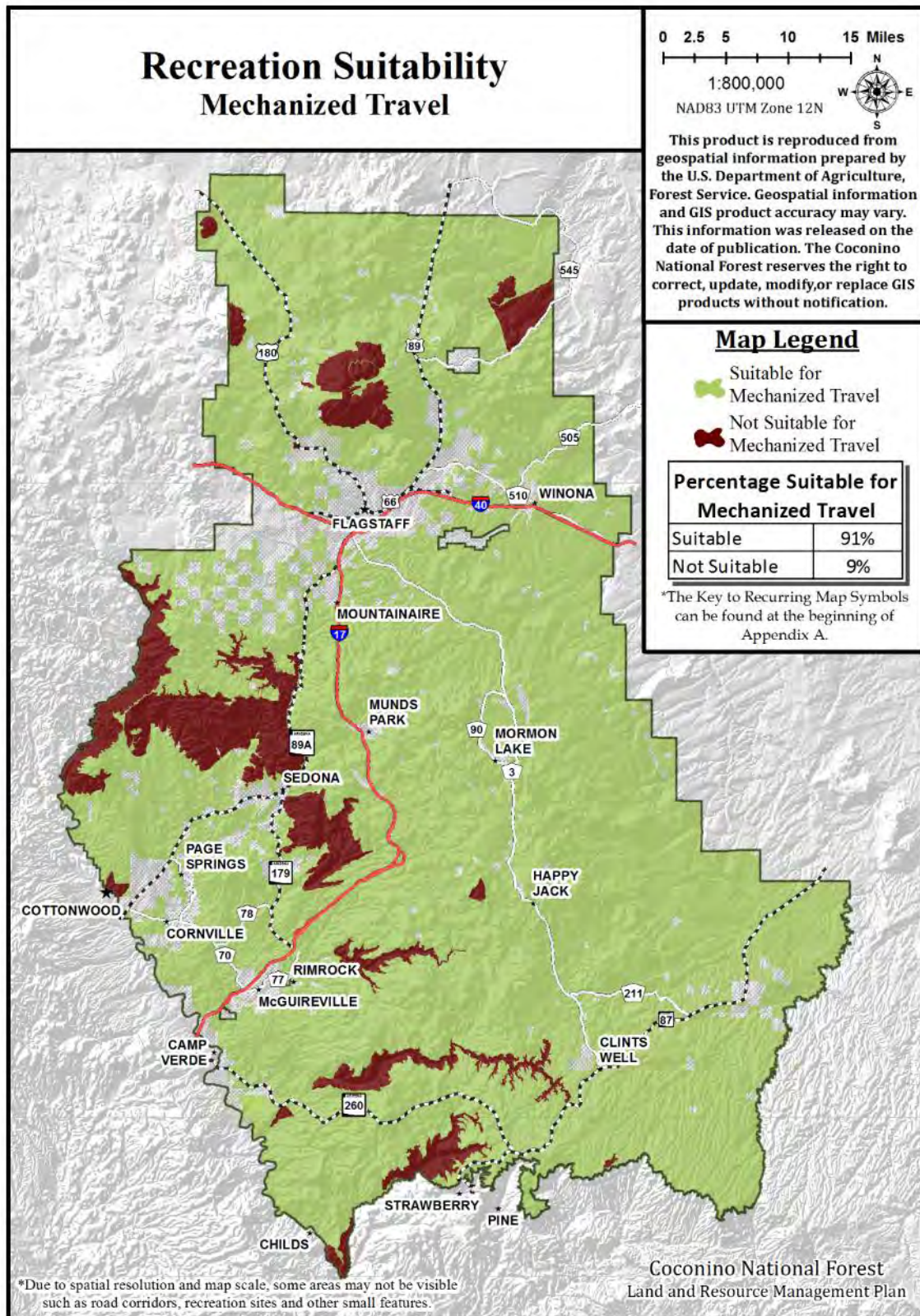
**Map 20. Recreation Suitability: Temporary Roads**





Map 21. Recreation Suitability: Motorized Trails





**Map 22. Recreation Suitability: Mechanized Travel**

# Appendix B. Proposed and Probable Management Practices

## Introduction

This appendix describes proposed and probable practices and timber sale schedule that may subsequently take place on the Coconino NF at the project or activity level to help maintain existing conditions or achieve the desired conditions described in the plan. Included are items such as program strategies; inventories, assessments, resource analyses and other planning needs; and ongoing work with partners and cooperating agencies anticipated during the next 10 to 15 years.

The listed proposed and probable management practices are not intended to be all-inclusive, nor are they intended to be decisions. They are simply projections of what actions may take place in the future. A plan amendment is not required to change or modify any of the proposed and possible actions. The list of these actions can be updated at any time through an administrative correction of the plan. More information may be found under plan objectives and management approaches.

## Forestwide Management

### Air

- Coordinate with the Arizona Department of Environmental Quality (ADEQ) on smoke impacts from wildfires and prescribed fires.

### Watersheds, Water Quality and Quantity

- Plan and implement improvement activities in watersheds which are functionally at risk or impaired.
- Secure water rights and participation in water right settlement and adjudication.
- Coordinate and educate with other government agencies to protect water quality and protect aquatic ecosystems from invasive plants and animals.

### Wetlands and Reservoirs/Lakes

- Restore wetlands that are not in proper functioning condition.
- Coordinate with the Arizona Game and Fish Department (AZGFD) and U.S. Fish and Wildlife Service (USFWS) on the management of sport and native fishes.

### Springs

- Reconstruct or restore riparian function to at least 25 springs identified as not in proper functioning condition

### Biophysical Features

- Coordinate with State and Federal agencies to manage and monitor bat roosts in order to determine population dynamics at least once every 3 years.

- Monitor significant caves or other biophysical features to determine visitor impacts and the conditions of key resources in order to protect the long-term ecology of the feature or resource.
- Participate in public education activities about disease prevention “best practices” for caves.
- Complete periodic updates to the list of significant caves on the Forest.

### **Paleontological Resources**

- Coordinate and collaborate, where possible, with the scientific community, non-Federal partners, and the general public.
- Promote educational programs, interpretive presentations, or publications to increase public awareness of forest paleontological resources and their significance.
- Complete paleontological surveys in areas where there is high potential to encounter these resources.

### **Soil**

- Maintain satisfactory soil conditions and improvement of impaired and unsatisfactory soil conditions. Treatments which move forest priority 6th code watersheds toward functioning properly condition should take precedence.
- Implement resource improvement projects that are beneficial for maintaining and improving (1) soil condition and productivity and (2) water quality and quantity.
- Complete onsite soil investigations and refinement of maps for soil disturbing projects that require site-specific, precise, and highly detailed soil information which is beyond the scale of the terrestrial ecosystem survey.
- Analyze or collect site-specific TEUI information, as needed, to accurately determine the limitations, suitabilities, and productivity potentials of the different terrestrial ecosystems that occur on the Forest.

### **Wildlife, Fish, and Plants**

- Implement actions to benefit federally listed and sensitive species by contributing to its recovery or supporting trends that avoid listing.
- Restore terrestrial and aquatic wildlife habitat.
- Coordinate with the AZGFD, USFWS, and interested parties on education, research, and activities that promote and enhance habitat conditions and species recovery.
- Maintain the native-fish-only status of Fossil Creek through remedial actions to remove invasives, increase public education, and provide signs and law enforcement.

### **All Vegetation ERUs**

- Restore maple and aspen stands.
- Coordinate with local research institutions.

### **Riparian Areas**

- Restore nonfunctioning or functioning-at-risk riparian areas so they are in or moving toward proper functioning condition.

### **Desert Communities**

- Construct trails and establishment of restrictions to prevent recreation impacts to Desert Communities.

### **Semi-desert Grasslands**

- Collaborate with partners and stakeholders on grassland restoration, grassland connectivity, and education.

### **Great Basin and Montane/Subalpine Grasslands**

- Distribute information to the media and general public that is focused on the unique properties of meadows and appropriate activities within meadows.
- Collaborate with partners and stakeholders on grassland restoration, connectivity, and education.
- Coordinate with the AZGFD on objectives for wildlife conservation, education, and habitat restoration and improvements, particularly regarding pronghorn and prairie dogs.

### **Interior Chaparral**

- Coordinate with local partners and stakeholders to reduce the risk of uncharacteristic fire in the wildland-urban interface (WUI) on the Coconino NF and adjacent lands of other ownership.

### **Pinyon and Juniper**

- Complete treatments in Pinyon Juniper ERUs to move toward desired conditions.
- Use naturally ignited fires to treat Pinyon Juniper Evergreen Shrub and Pinyon Juniper with Grass with low to mixed severity fire.

### **Ponderosa Pine**

- Thin and use prescribed fires and naturally ignited fires to treat ponderosa pine.

### **Mixed Conifer Types**

- Use prescribed fires and naturally-ignited fires to treat mixed conifer ERUs.

### **Spruce-Fir and Alpine Tundra**

See “Wilderness.”

## **Invasive Species Management**

- Complete treatments in areas containing invasive species to restore native vegetation.
- Complete treatments in aquatic systems containing invasive species to restore native fish populations.
- Prioritize wilderness areas, research natural areas, botanical areas, wild and scenic areas, and riparian areas for control of invasive exotic species to maintain the integrity of native species populations in these unique and rare habitats.
- Maintain a current inventory of invasive exotic species on forest lands.
- Coordinate invasives species management activities with internal and external partners and stakeholders to reduce, minimize, or eliminate the potential for the introduction, establishment, spread, and impact of invasive species.

## **Fire Management**

- Complete treatments in WUI areas to reduce fire hazards to communities and the Forest.
- Coordinate with other jurisdictions such as communities; service providers (infrastructure); and county, Federal, State, tribal, and local entities regarding prevention, preparedness, planned activities, and responses to wildland fires. Provide notification of upcoming and ongoing fire season activities and any prescribed fire activities to these jurisdictions.
- Implement initial attack activities and other activities to manage naturally-ignited wildfires for resource objectives.
- Participate in the development and implementation of community wildfire protection plans to promote public safety and to reduce the risk of wildfire on lands of other ownership.

## **Livestock Grazing**

- Review active allotment management plans on a regular basis.
- Maintain and reconstruct fencing, waters, and other structural range improvements when necessary.

## **Forest Products**

- Ensure the sustainability of special forest products through observation of commercial sales and personal use permit harvest levels.

## **Minerals Resources**

- Coordinate with the Bureau of Land Management (BLM) to properly process applications for mineral entry on the forest.
- Request withdrawal of some areas on the forest from mineral entry.
- Rehabilitate mineral operations sites that are no longer in use.

## **Heritage Resources**

- Complete project clearances required under existing law, regulation, and policy.

- Complete class of property analysis to better understand site classes and provide more cost-effective clearances.
- Complete non-project-related archaeological surveys in area of moderate or very high site density.
- Stabilize historic structures.
- Participate in partnerships with the Arizona Site Stewards Program, the Arizona Archaeological Society, National Park Service, and the Museum of Northern Arizona to study, protect, and monitor sites.
- Protect cultural and biological resources in the vicinity of Hartwell Canyon.
- Curate records and artifacts through agreements with Forest Service approved repositories.
- Support offsite educational/enrichment products such as classroom programs, heritage celebrations, publications, and field trips.
- Update the cultural resources overview as archaeological study units are defined and existing class of property classes are analyzed.

### **Tribal Relations and Uses**

- Continue tribal consultation on projects and needs as they arise.
- Observe memoranda of understanding between the Forest and consulting American Indian tribes to guide consultation processes and reflect the tribes' particular perspectives and interests.
- Participate in regular meetings with tribes to understand their needs.
- Develop a consistent forest productions collection policy and tribal firewood program for use on both the Coconino and Kaibab National Forests by working with the Kaibab National Forest and local tribes.
- Create volunteer opportunities for tribal members.

### **Roads and Facilities**

- Naturalize or decommission unauthorized roads and system roads to create a more cost-effective road system and to restore natural resources impacted by roads.
- Construct and close new temporary and permanent roads to support ecosystem restoration activities.
- Coordinate with local, State, and Federal agencies to mitigate impacts from community, highway, and interstate road reconstruction and management needs.
- Implement effective wildlife passage improvement projects.
- Issue road use permits to private landowners who use forest roads and take maintenance responsibility for roads that primarily serve private uses.
- Evaluate outdated facilities and sites for current and future needs, potential reuse, and the capacity to update or retrofit them in order to meet the agency's mission in an economical manner.



## **Land Adjustments**

- Consult with local governments about land adjustment proposals the Coconino NF plans to carry forward and conduct NEPA (National Environmental Policy Act) analysis.
- Encourage open space designations on private land (located between private development and national forest lands) as a buffer to minimize conflicts between residents and other forest users.
- Coordinate with landowners and local and regional governments to encourage private land uses that are compatible with the Forest's desired conditions.
- Coordinate with local and regional governments and road agencies to develop transportation solutions that reduce traffic and vehicle impacts on National Forest System lands.
- Ensure reasonable road ingress and egress to private property in the Neighborwoods Management Area that allows fire engines mobility and access.
- Acquire right-of-way agreements for the public and Forest Service uses.

## **Special Uses**

- Issue and supervise permits for new special use activities on the Forest including: powerlines, special events, large group gatherings, outfitter-guide activities, and research.
- Rehabilitate existing special use sites that do not meet the scenery guidelines as they are brought up for reauthorization or are no longer required.
- Issue and supervise forest product or vegetation management permits to lessen abrupt vegetation transition in powerline rights-of-way, where it is necessary to clear the right-of-way boundary to meet national standards.
- Complete updates to communication site plans for existing and new communication sites.
- Coordinate with the research community to identify and manage long-term research locations, with the intent of balancing research and management needs.
- Identify preapproved sites for recreation events and large group gatherings on the Forest.
- Coordinate with the AZGFD for wildlife viewing permits.

## **Dispersed Recreation**

- Develop trail systems for bikes, equestrians, and motorized recreation users.
- Complete updates and changes to the motor vehicle use map to achieve forest plan desired conditions.
- Maintain trails according to development level and managed use.
- Develop a management plan for the Cinder Hills OHV areas.
- Coordinate with the Great Western Trail Association and associated groups to maintain its long-distance trail opportunity.
- Complete updates to the memorandum of understanding between the National Park Service and the Coconino NF.
- Develop interpretive plans.
- Participate in outdoor classrooms for school groups and other partnership opportunities with local schools.

- Develop education and outreach programs and/or signs to help reduce user conflicts, such as conflicts between motorized and non-motorized users.
- Implement management actions to discourage illegal activity and/or creation of unauthorized routes.
- Implement management strategies to reduce user conflicts and address resource concerns.
- Develop interpretive sites as opportunities become available and in conjunction with partners.
- Maintain interpretive signs and exhibits.
- Distribute visitor information at Forest Service offices, visitor centers, and other locations.

### **Developed Recreation**

- Implement vegetation management activities in developed recreation sites, including periodic reviews of vegetation health and opportunities for vegetation to provide screening or manage recreation site concerns—following the protocol for removing hazard trees, where needed. Continue an active tree planting or a regeneration program (where old, diseased, or damaged trees exist) to provide shade and scenic quality.
- Improve facilities’ operating efficiency and sustainability through new construction and repairs. Consider energy efficiency through the implementation of recycled or renewable resources which produce a smaller carbon footprint.
- Complete accessibility assessments on developed recreation sites.
- Complete regular patrols at developed facilities to check for public safety, facility/resource protection, and fee compliance.

### **Scenic Resources**

- Rehabilitate areas that do not meet or exceed their desired scenic integrity objective (SIO).
- Cooperate with other entities, such as the Arizona Department of Transportation, local governments, and commercial and private entities to protect scenic integrity on and adjacent to the Forest.

### **Special Areas**

#### **Wilderness**

- Rehabilitate wilderness sites or areas that have been impacted by recreation in order to restore wilderness character.
- Implement corrective measures, such as a wilderness permit system, if overuse causes unacceptable resource damage.
- Establish limits of acceptable change for all wilderness areas.
- Implement various management actions to prevent bicycle use in wilderness including: ranger patrols, placement of bike racks near wilderness boundaries or portals, “wilderness ahead” signs located outside of wilderness, improved trail design, and expanded trail opportunities outside of wilderness.

- Complete regular wilderness ranger patrols in wilderness areas.
- Develop and implement management plans for wilderness areas on the forest.
- Develop and implement management plans for any newly designated wilderness areas by 5 years after the designation occurs.

### **Wild and Scenic Rivers**

- Coordinate with the ADEQ to monitor and achieve acceptable total maximum daily loads (TMDLs) for suspended sediment concentration in the Verde River.
- Implement comprehensive river management plans for the Verde River and Fossil Creek Wild and Scenic Rivers.

### **Arizona National Scenic Trail**

- Maintain and reroute the trail in coordination with the Arizona Trail Association and adjacent landowners.

### **General Crook National Recreation Trail**

- Manage the 138-mile trail corridor (portion located on National Forest System land) from Fort Whipple to Fort Apache and associated historic sites and side trails for potential congressional designation as a national historic trail.
- Develop one representative visual logo for the entire trail by working with adjacent national forests and local entities.

### **National Scenic Byways**

- Coordinate activities and design of byway facilities with the appropriate byway association and byway plan.

### **Research Natural Areas and Botanical and Geological Areas**

- Prepare establishment reports for the proposed Rocky Gulch, West Clear Creek RNAs, and a proposed eastern expansion of the San Francisco Peaks Research Natural Areas.
- Establish a site stewards program for onsite interpretation and monitoring of the Cottonwood Basin Geological and Botanical Area.

### **Environmental Study Areas**

- Manage trails and uses in conjunction with the curriculum needs of the associated public schools.
- Develop environmental education programs cooperatively with public schools.

## Appendix C. Species Crosswalk

The following is a crosswalk comparing the common, scientific, and other names attributed to plant and wildlife species discussed in the plan as of the date of publishing. Note that common names and scientific names can change frequently.

	Common Name	Scientific Name	Other Name
<b>Amphibians and Reptiles</b>	Chiricahua leopard frog	<i>Lithobates chiricahuensis</i>	Formerly known as <i>Rana chiricahuensis</i>
	Lowland leopard frog	<i>Lithobates yavapaiensis</i>	Formerly known as <i>Rana yavapaiensis</i>
	Narrow-headed gartersnake	<i>Thamnophis rufipunctatus</i>	
	Northern Mexican gartersnake	<i>Thamnophis eques megalops</i>	
<b>Birds</b>	American peregrine falcon	<i>Falco peregrinus anatum</i>	
	Bald eagle	<i>Haliaeetus leucocephalus</i>	
	Bell's vireo	<i>Vireo bellii</i>	
	Golden eagle	<i>Aquila chrysaetos</i>	
	Mexican spotted owl	<i>Strix occidentalis lucida</i>	
	Mourning doves	<i>Zenaida macroura</i>	
	Northern goshawk	<i>Accipiter gentilis</i>	
	Pygmy nuthatch	<i>Sitta pygmaea</i>	
	Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	
	Turkey	<i>Meleagris gallopavo merriami</i>	
	Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	
	Woodpecker	<i>Melanerpes</i> species, <i>Picoides</i> species	
<b>Fish</b>	Gila trout	<i>Oncorhynchus gilae gilae</i>	
	Headwater chub	<i>Gila nigra</i>	
	Little Colorado spinedace	<i>Lepidomeda vittata</i>	
	Roundtail chub	<i>Gila robusta</i>	
	Spikedace	<i>Meda fulgida</i>	
<b>Insect</b>	Carpenter bees	<i>Xylocopa</i> species	
<b>Mammals</b>	American pronghorn	<i>Antilocapra americana</i>	Pronghorn
	Abert's squirrel	<i>Sciurus aberti</i>	Tassel-eared squirrel
	Black bear	<i>Ursus americanus</i>	American black bear
	Cottontail rabbit	<i>Sylvilagus audubonii</i>	
	Elk	<i>Cervus canadensis</i>	
	Javelina	<i>Pecari tajacu</i>	Collared peccary
	Mountain lion	<i>Puma concolor</i>	Cougar
	Mule deer	<i>Odocoileus hemionus</i>	
	Prairie dogs	Specifically <i>Cynomys gunnisoni</i>	

	Common Name	Scientific Name	Other Name
<b>Mammals (continued)</b>	Rocky Mountain bighorn sheep	<i>Ovis canadensis canadensis</i>	
	White-tailed deer	<i>Odocoileus virginianus</i>	
<b>Plants</b>	Agave	<i>Agave species</i>	
	Alder	<i>Alnus incana</i> subsp. <i>tenuifolia</i> , <i>Alnus oblongifolia</i>	Thin-leaf alder, Arizona alder
	Alligator juniper	<i>Juniperus deppeana</i>	
	Alpine clover	<i>Trifolium alpinum</i>	
	Alpine timothy	<i>Phleum alpinum</i>	
	Arizona cliffrose	<i>Purshia subintegra</i>	
	Arizona cypress	<i>Hesperocyparis arizonica</i>	
	Arizona fescue	<i>Festuca arizonica</i>	
	Arizona sycamore	<i>Platanus wrightii</i>	
	Arizona walnut	<i>Juglans major</i>	
	Bebb willow	<i>Salix bebbiana</i>	Bebb's willow
	Big Sacaton grass	<i>Sporobolus wrightii</i>	
	Bigtooth maple	<i>Acer gradidentatum</i>	
	Black-footed ferrets	<i>Mustela nigripes</i>	
	Black grama	<i>Bouteloua eriopoda</i>	
	Blue grama	<i>Bouteloua gracilis</i>	
	Blue spruce	<i>Picea pungens</i>	
	Boxelder	<i>Acer negundo</i>	
	Bristlecone pine	<i>Pinus aristata</i>	
	Bush muhly	<i>Muhlenbergia porteri</i>	
	Bulrush	Includes: <i>Schoenoplectus acutus</i> , <i>Schoenoplectus americanus</i> , <i>Scirpus microcarpus</i> , <i>Scirpus pallidus</i> , and <i>Schoenoplectus tabernaemontani</i>	Hardstem bulrush
	Catclaw mimosa	<i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	
	Cherry	<i>Prunus species</i>	
	Cattail	<i>Typha species</i>	
	Colorado blue columbine	<i>Aquilegia caerulea</i> var. <i>pinetorum</i>	
	Common juniper	<i>Juniperus communis</i>	
	Corkbark fir	<i>Abies lasiocarpa</i> var. <i>arizonica</i>	
	Creosote bush	<i>Larrea tridentata</i>	
	Crucifixion thorn	<i>Canotia holacantha</i>	
	Curly mesquite grass	<i>Hilaria belangeri</i>	
	Currant	<i>Ribes species</i>	
	Deergrass	<i>Muhlenbergia rigens</i>	
	Desert willow	<i>Chilopsis linearis</i>	

	Common Name	Scientific Name	Other Name
<b>Plants (continued)</b>	Dock	<i>Rumex species</i>	
	Dogwood	<i>Cornus sericea</i>	Redosier dogwood
	Douglas-fir	<i>Pseudotsuga menziesii</i>	
	Engelmann spruce	<i>Picea engelmannii</i>	
	Foxtail barley	<i>Hordeum jubatum</i>	
	Fremont barberry	<i>Berberis repens</i>	
	Fremont cottonwood	<i>Populus fremontii</i>	
	Galleta grass	<i>Pleuraphis species</i>	
	Gambel oak	<i>Quercus gambelii</i>	
	Hairy grama	<i>Bouteloua hirsuta</i>	
	Honeysuckle	<i>Lonicera arizonica</i>	
	Junegrass	<i>Koeleria macrantha</i>	Prairie junegrass
	Kentucky bluegrass	<i>Poa pratensis</i>	
	Limber pine	<i>Pinus flexilis</i>	
	Live (evergreen) oaks	<i>Quercus chrysolepsis</i> , <i>Q. emoryi</i> , <i>Q. arizonica</i> , <i>Q. hypoleucoides</i> , <i>Q. grisea</i>	Emory, Arizona white, silverleaf, grey (gray)
	Mannagrass	<i>Glyceria species</i>	
	Manzanita	<i>Arctostaphylos species</i>	Pointleaf manzanita, green leaf manzanita, Pringle manzanita
	Mesquite	<i>Prosopis species</i>	
	Mistletoe	<i>Arceuthobium species</i>	Witches' broom
	Mountain muhly	<i>Muhlenbergia montana</i>	
	Mountain mahogany	<i>Cercocarpus species</i>	
	Mountain rush	<i>Juncus arcticus</i>	Baltic rush
	Muttongrass	<i>Poa fendleriana</i>	
	Narrowleaf cottonwood	<i>Populus angustifolia</i>	
	Needle and thread grass	<i>Hesperostipa comata</i>	
	New Mexico locust	<i>Robinia neomexicana</i>	
	Nodding brome	<i>Bromus anomalus</i>	
	One-seed juniper	<i>Juniperus monosperma</i>	
	Oregon willow herb	<i>Epilobium oregonense</i>	
	Pine dropseed	<i>Blepharoneuron tricholepis</i>	
	Ponderosa pine	<i>Pinus ponderosa</i>	
	Quaking aspen	<i>Populus tremuloides</i>	
	Red berry juniper	<i>Juniperus coahuilensis</i>	
	Red threeawn	<i>Aristida purpurea</i>	Purple threeawn
	Rock fleabane	<i>Erigeron saxatilis</i>	Cliff fleabane
	Rocky Mountain juniper	<i>Juniperus scopulorum</i>	
	Rusby's milkvetch	<i>Astragalus rusbyi</i>	

	Common Name	Scientific Name	Other Name
<b>Plants (continued)</b>	San Francisco Peaks ragwort	<i>Packera franciscanus</i>	<i>Senecio franciscanus</i>
	Sedges	<i>Carex species</i>	
	Senator Mine alumroot	<i>Heuchera eastwoodiae</i>	
	Single-leaf pinyon pine	<i>Pinus edulis</i> var. <i>fallax</i>	<i>P. monophylla</i> var. <i>fallax</i>
	Skunkbush	<i>Rhus trilobata</i>	Skunkbush sumac
	Southwestern white pine	<i>Pinus strobiformis</i>	
	Spike muhly	<i>Muhlenbergia wrightii</i>	
	Spikerush	<i>Eleocharis species</i>	
	Spruce	<i>Picea engelmannii</i> , <i>Picea pungens</i>	Engelmann spruce, blue spruce
	Squirreltail	<i>Elymus elymoides</i>	
	Subalpine fir	<i>Abies lasiocarpa</i>	
	Sumac	<i>Rhus species</i>	
	Sunset Crater beardtongue	<i>Penstemon clutei</i>	
	Three-awn	<i>Stipagrostis pungens</i>	
	Timberland blue-eyed grass	<i>Sisyrinchium longipipes</i>	
	Turbinella oak	<i>Quercus turbinella</i>	Scrub oak
	Two-needle pinyon pine	<i>Pinus edulis</i>	Colorado pinyon pine
	Utah juniper	<i>Juniperus osteosperma</i>	
	Velvet ash	<i>Fraxinus velutina</i>	
	Western wheatgrass	<i>Pascopyrum smithii</i>	
	White fir	<i>Abies concolor</i>	
	Willows	<i>Salix species</i>	
	Woods rose	<i>Rosa woodsii</i>	
	Yarrow	<i>Achillea species</i>	
<b>Other</b>	Three-awn	<i>Stipagrostis pungens</i>	



## Appendix D. Other Sources of Information

This appendix includes laws, regulations, Forest Service policy and/or direction, and it references best management practices and useful, current science (at the time of writing this plan). These sources are important in designing projects and activities to achieve desired conditions. They are organized by resource area. Most, if not all, of these relevant documents are available from Forest Service offices.

### Forestwide Management

#### All Ecosystems

National Pollinator BMPs, latest draft is dated May 11, 2015.

#### Air Quality

##### *Executive Orders*

EO 11514, 1970 Protection and enhancement of environmental quality.

##### *Congressional Acts*

Clean Air Act, as amended 1977 and 1990, Regional Haze Rule to meet PM 2.5 and ozone standards.

##### *Forest Service Manual*

FSM 2580.2 – 2580.3 Watershed and Air Management, Chapter 80 Air Resource Management, Objectives and Policy.

##### *Other*

Arizona Regional Haze Implementation Plan

(<http://www.azdeq.gov/function/forms/docs.html#sip>); Arizona Revised Statute 49-501; Arizona Administrative Code Title 18 Chapter 2 Article 15 Forest and Range Management Burns (<http://www.azdeq.gov/environ/air/smoke/download/prules.pdf>).

Coconino County Lighting Code, Section 17

Yavapai County Light Pollution Control Ordinance, Section 603

City of Flagstaff Outdoor Lighting Standards, Division 10-50.70.

City of Sedona Outdoor Lighting Code, Section 911.

City of Cottonwood Outdoor Lighting Code, Section 408

#### Soil

##### *Congressional Acts*

Multiple Use-Sustained Yield Act of 1960; Bankhead-Jones Farm Tenant Act of 1937 as Amended.

##### *Forest Service Manual*

FSM 2550 Watershed and Air Management, Chapter 50, Soil Management.

##### *Forest Service Handbook*

FSH 2509.18; Soil Management Handbook; FSH 2509.22, Soil and Water Conservation Handbook.

##### *Other*

2012 National Core BMP Technical Guide FS 990a

## **Biophysical Features - Geological Features**

### ***Congressional Acts***

Federal Cave Resources Protection Act of 1988, 16 U.S.C. 4301–4309.

### ***Code of Federal Regulations***

36 CFR 290: Parks, Forest and Public Property, Cave Resources Management.

### ***Forest Service Manual***

FSM 2800 Minerals and Geology, Geologic Resources, Hazards and Services; FSM 2356 Cave Management.

## **Biophysical Features - Paleontological Resources**

### ***Congressional Acts***

Organic Act of 1897 (16 USC 551); Bankhead-Jones Tenant Act of 1937 (7 USC 1101); 1906 Antiquities Act<sup>1</sup>, FS Special Uses Manual 2701.1-2; National Environmental Policy Act of 1969: 42 U.S.C. 4321, sec. 101(b).; Forest and Rangeland Renewable Resources Planning Act of 1974, as amended; 1979 Archeological Resources Protection Act; 1988 Federal Cave Resources Protection Act; PL 101-510 (H.R. 4739, sec. 2825); Paleontological Resources Preservation Act of 2009<sup>2</sup> (PL 111-011).

### ***Code of Federal Regulations***

7 CFR 2.60: Delegation of Authority from Secretary of Agriculture to Chief, Forest Service to regulate use and occupancy of National Forest System Lands; and to issue appropriate regulations under 36 CFR 261, Prohibitions; 43 CFR Part 3; 7 CFR 3100.41(a); 36 CFR 251; 36 CFR 251.53(a) and (f) permits for vertebrate fossil collection for scientific and education purposes only; 36 CFR 261.2, 261.9(i), 261.70(a)(5): Prohibitions Section, Orders, special closures, and ability for regions to issue regulations for protection of paleontological resources; 36 CFR 228.62(e) Free-use permit may be required for limited collection of petrified wood for personal use by amateur collectors and scientists. Material cannot be bartered or sold; 36 CFR 296.5(b) (2); 36 CFR 290; 36 CFR 292.41, second definition of paleontological resources; 43 CFR 3505.11.

### ***Forest Service Manual***

FSM 2880 Geologic Resources, Hazards and Services; FS Manual 2701.1–2 Paleontological resources management under 1906 Antiquities Act; FSM 2860 Recreational collecting of mineral and fossil material under acquired lands.

## **Watersheds and Water, Constructed Waters, Riparian Areas**

### ***Executive Orders***

EO 11990, 1977 Wetlands Management; EO 11998, 1977 Floodplain Management.

### ***Congressional Acts***

Federal Water Pollution Control Act of 1956 and Amendments of 1972 (Clean Water Act); Organic Administration Act, 1897 as Amended; National Forest Management Act, 1976; Safe

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<sup>1</sup> Indicates discrepancy: the 1906 Antiquities Act does not cover paleontological resources according to the courts.

<sup>2</sup> The Forest Service, along with other interagency partners and scientists, is developing implementing regulations for the Paleontological Resources Preservation Act of 2009.

Drinking Water Act, 1977; North American Wetland Conservation Act of 1989 (16 U.S.C. 4401 (note), 4401–4413, 16 U.S.C. 669b (note)).

#### ***Forest Service Manual***

FSM 2510-2520 Watershed and Air Management, Watershed Planning and Watershed Protection and Management; FSM 2530 Water Resource Management; FSM 2540 Water Uses and Development, Regional Supplement No. 2500–2001-1; FSM 2502–2503 Watershed and Air Management, Objectives and Policy; FSM 2541.03 Water Uses and Developments, Policy; FSM 2541.12 Instream and Standing Water Requirements; FSM 2521 Watershed Protection and Management, Watershed Condition Assessment; FSM 2502 and 2503 Watershed and Air Management, Objectives and Policy; FSM 2521.11(b) Watershed Condition Assessment, Priority Setting; FSM 2880 Geologic Resources, Hazards and Services

#### ***Forest Service Handbook***

FSH 2509.16 Water Resource Inventory Handbook; FSH 2509.22 Soil and Water Conservation Handbook, Region 3, Chapter 10–40, FSH 2509.23 Riparian Area Handbook; FSH 2509.13 Burned-Area Emergency Rehabilitation Handbook; FSM 2526, Watershed and Air Management, Riparian Area Management.

#### ***Other***

2012 National Core BNP Technical Guide FS 990a; 2011 Watershed Condition Framework FS 977; Regional Groundwater-Flow Model of the Redwall-Muav, Coconino, and Alluvial Basin Aquifer Systems of Northern and Central Arizona (2011)

## **Terrestrial Ecological Response Units**

#### ***Congressional Acts***

Organic Act of 1897 (16 U.S.C. 475, 551); Organic Administration Act of 1897 (16 U.S.C. 475, 551); Weeks Law of 1911, as amended (16 U.S.C. 515, 552); Knutsen-Vandenberg Act of 1930 (16 U.S.C. at 576b); Anderson-Mansfield Reforestation and Revegetation Joint Resolution Act of 1949 (16 U.S.C. 581j and 581j(note)); Granger-Thye Act of 1950 (16 U.S.C. at 580g-h); Surfaces Resources Act of 1955 (30 U.S.C. 611-614); Sikes Act (Fish and Wildlife Conservation) of September 15, 1960 (16 U.S.C. at 670g); Multiple-Use Sustained Yield Act of 1960 (MUSYA) (16 U.S.C. 528-531); Wilderness Act of 1964 (16 U.S.C. §§ 1131 et seq.); Wild and Scenic Rivers Act (82 Stat. 906, as amended, 16 U.S.C. 1271 (note), 1271-1287); National Environmental Policy Act (NEPA) of 1969 (16 U.S.C. 4321 et seq.); Endangered Species Act of 1973 (P.L. 93-205, 87 Stat. 884; 16 U.S.C. 1531–1544, as amended); Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended by National Forest Management Act of 1976 (16 U.S.C. 1600–1614, 472a); Clean Water Act of 1977 (33 U.S.C. 1251, 1254, 1323, 1324, 1329, 1342, 1344; 91 Stat. 1566); Clean Air Act, as amended 1977 and 1990 (42 U.S.C. 7401, 7418, 7470, 7472, 7474, 7475, 7491, 7506, 7602); Healthy Forests Restoration Act of 2003 (16 U.S.C. at 1611–6591).

#### ***Executive Orders***

EO 11514 Protection and enhancement of environmental quality; EO 11644 Use of off-road vehicles on the public lands; EO 11988 Floodplain management; EO 11989 Use of off-road vehicles on the public lands; EO 11990 Protection of wetlands; EO 13112 Invasive Species.

***Code of Federal Regulations***

35 CFR 4247 Protection and enhancement of environmental quality; 37 CFR 2877 Use of off-road vehicles on the public lands; 42 CFR 26951 Floodplain management; 42 CFR 26961 Protection of wetlands; 64 CFR 6183 Invasive Species.

***Forest Service Manual***

FSM 5100 Fire Management; FSM 2020 Ecosystem Restoration; FSM 2540 Water Uses and Development, Regional Supplement No. 2500–2001-1; FSM 2880 Geologic Resources, Hazards and Services.

***Forest Service Handbook***

FSH 2090.11 Ecological Classification and Inventory Handbook.

**Wildlife, Fish, and Plants**

***Executive Orders***

EO 13186, Responsibility of Federal Agencies to Protect Migratory Birds.

***Congressional Acts***

Bankhead-Jones Farm Tenant Act of 1937; Multiple Use-Sustained Yield Act of 1960; National Forest Management Act of 1976; Endangered Species Act of 1973; Migratory Bird Treaty Act of 1918; Sikes Act of 1960; 3150.2 State and Private Forestry, Rural Community Fire Protection Program, Objectives; Federal Noxious Weed Act of 1975.

***Code of Federal Regulations***

36 CFR 241.2 Parks, Forests, and Public Property, Fish and Wildlife, Cooperation in Wildlife Management.

***Forest Service Manual***

FSM 2402 Timber Management, Objectives; FSM 2470.2–2470.3 Timber Management, Chapter 70 Silvicultural Practices, Objectives and Policy; FSM 2670–2671 Wildlife, Fish, and Sensitive Plant Habitat Management, Chapter 70, Threatened, Endangered, and Sensitive Plants and Animals, Cooperation; FSM 2671.45 C & F 2671 Wildlife, Fish, and Sensitive Plant Habitat Management, Interim Directives; FSM 3110.2 State and Private Forestry, Cooperative Forest Fire Prevention, Objectives.

***Other***

1982 Rule Provisions, Sections 219.13–219.26; U.S. Fish and Wildlife Service Wind Turbine Guidelines Advisory Committee Recommendations to the Secretary, March 4, 2010; Avian Power Line Interaction Committee (APLIC) Guidelines; *Hedeoma diffusum* Management Plan (1984); *Cimicifuga arizonica* Conservation Plan (1995); San Francisco Peaks Alpine Tundra Management Plan (1984). U.S. Fish and Wildlife Service Mexican Spotted Owl Recovery Plan, First Revision (2012); U.S. Fish and Wildlife Service National Bald Eagle Management Guidelines (2007); Conservation Assessment and Strategy for the Bald Eagle for Arizona, Technical Report 173 (2006). Rare Invertebrate Species for Coconino National Forest (Stevens and Ledbetter, 2014); and Rare Plant Species for Coconino National Forest (Hodgson and Waring 2012); Forest Service, U.S. Department of Agriculture, U.S. Department of the Interior, Bureau of Land Management, and Association of Fish and Wildlife Agencies Policies and Guidelines for Fish and Wildlife Management in National Forest and Bureau of Land Management Wilderness (2006).

## **Invasive Species**

### ***Executive Orders***

EO 13112, Wetlands Management.

### ***Congressional Acts***

Federal Noxious Weed Act of 1974, P.L. 93–629, as amended;

### ***Forest Service Manual***

FSM 2080.5, Noxious Weed Management; FSM 2150, Pesticide-Use Management and Coordination; FSM 2900, Invasive Species Management

### ***Other***

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947; National Strategy and Implementation Plan for invasive Species Management, FS-805 (2004); U.S. Forest Service Invasive Species Program website: <http://www.fs.fed.us/invasivespecies/index.shtml>.

## **Fire Management**

### ***Congressional Acts***

National Environmental Policy Act of 1969; National Forest Management Act of 1976; Federal Land Assistance, Management, and Enhancement (FLAME) Act of 2009.

### ***Forest Service Manual***

FSM 5110.2 Fire Management, Wildfire Prevention, Objective; FSM 5120 Fire Management, Preparedness; FSM 5130.2 Wildland Fire Suppression, Objective; Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (FSM 5101, 5103, and 5108); FSM 5140.2 Fire Use, Objectives; FSM 5140.3 Fire Use, Policy; FSM 5171, Agreements with Federal Agencies; Interagency Prescribed Fire, Planning and Implementation Procedures Guide, Element 19-Smoke Management & Air Quality (USDA, USDOJ) 2008; Guidance for Implementation of Federal Wildland Fire Management Policy, 2009; FSM 3110.2 Cooperative Forest Fire Prevention, Objective; FSM 3110.3 Policy (Smokey Bear); FSM 2324.2 Wilderness Management, Management of Fire; FSM 5100, Fire Management.

### ***Forest Service Handbook***

FSH 5109.19 Chapter 50 Fire Management Analysis and Planning Handbook, Fire Management Planning.

### ***Other***

The 1995/2001 Federal Wildland Fire Management Policy and Program Review; The Wildland and Prescribed Fire Management Policy and Implementation Procedures Reference Guide; The Interagency Fire Management Plan template by the Fish and Wildlife Service, 2008 [www.fws.gov/fire/fmp/development/July08\\_FWS\\_template\\_guidance.doc](http://www.fws.gov/fire/fmp/development/July08_FWS_template_guidance.doc); National Cohesive Wildland Fire Management Strategy; USDOJ, National Fire Plan, 2001. The Coconino National Forest Fire Management Plan, 2010; Community Wildfire Protection Plans (CWPP) for Flagstaff and surrounding communities, Blue Ridge and Mogollon Rim communities, Greater Williams Area, and the Tusayan community, and the Rim Country communities.

## **Livestock Grazing**

### ***Congressional Acts***

Bankhead Jones Farm Tenant Act of 1937.

### ***Code of Federal Regulations***

36 CFR 213 Administration of Lands under Title III of the Bankhead-Jones Farm Tenant Act by the Forest Service.

### ***Forest Service Manual***

FSM 2202 Range Management, Objectives; FSM 2230.2 and 2230.3 Grazing and Livestock Use Permit System, Objective and Policy; FSM 2231.02 Grazing and Livestock Use Permit System, Requirements for Permits with Term Status; FSM 2240.2 and 2240.3 Range Improvements, Objective and Policy; FSM 2242.02 Structural Range Improvements, Objective; FSM 2242.03 Policy; FSM 2243.02 Nonstructural Range Improvements, Objective; FSM 2243.03 Policy; FSM 2250.2 and 2250.3 Range Cooperation, Objective and Policy; FSM 2270.3 Information Management and Reports, Policy; FSM 2237.03 Range Management, Policy; FSM 2541.03 Water Uses and Development, Policies; FSM 2253.4 Range Cooperation, Cooperation with Others; FSM Information Management and Reports, Policy; FSM 2323.22 Management of Range, Policy.

### ***Forest Service Handbook***

FSH 2209.13, Chapter 10 Grazing Permit Administration Handbook, Permits with Term Status; FSH 2209.13, Chapter 12.31 Grazing Permit Administration Handbook, Permits with Term Status, Upper Limits; FSH 2209.13, R3 Supplement, 19.1 – Drought Guidelines, FSH 2209.13 Chapter 90 Rangeland Management Decision-Making.

### ***Other***

Interagency Technical Reference (USDA, USDOJ), Utilization Studies and Residual Measurements, 1996; Technical Reference 4400-5 Rangeland Inventory & Monitoring, Supplemental Studies, 1992; Technical Reference 4400-7 (BLM) Rangeland Monitoring Analysis, Interpretation, and Evaluation, 1985; Technical Reference 4400-8 (BLM) Rangeland Monitoring, Statistical Considerations, 1992.

## **Forest Products**

### ***Congressional Acts***

National Environmental Policy Act of 1969; National Forest Management Act of 1976.

### ***Code of Federal Regulations***

36 CFR 223.5 through 36 CFR 223.10 Parks, Forests, and Public Property, Scope of Free-Use Granted to Individuals, Cutting and Removal of Timber in Free-Use Areas, Permission for Free-Use of Timber Outside Free-Use Areas, Delegations of Authority to Approve Free Use by Individuals, Free-Use to Owners of Certain Mining Claims, Free-Use to Alaskan Settlers, Miners, Residents, and Prospectors; 36 CFR 223.2 Disposal of Timber for Administrative Use; 7 CFR 2.60 Agriculture, Chief, Forest Service; 36 CFR 223.12 Permission to Cut, Damage, or Destroy Trees without Advertisement; 36 CFR 800, National Historic Preservation Act; 36 CFR 223.261 Sale and Disposal of National Forest System Timber; Special Forest Products and Forest Botanical Products.

### ***Forest Service Manual***

FSM 2000, Chapter 2020.12(5), Ecological Restoration and Resilience, Executive Orders; Chapter 2020.3(2) Policy; FSM 2400, Timber Management, Chapter 2462, Free Use of

Timber; Chapter 2463, Administrative Use; FSM 2400, Chapter 2467 Sales of Special Forest Products, 36 CFR 223.1 Authority to Sell Timber; FSM 2400, Chapter 2431 Management of Timber Sale Program.

***Forest Service Handbook***

FSH 2409.18, Timber Sale Preparation; Section; FSH 2409.18-2009-2, Section 82.5 Trees, Portions of Trees, or Forest Products Free of Charge for Indian Tribes for Non-Commercial Traditional and Cultural Purposes; FSH 2409.19 Renewable Resources Handbook; FSH 1909.15, Environmental Policy and Procedures Handbook; FSH 2409.19, Timber Sale Administration Handbook.

***Other***

Forest Service National Resource Guide to American Indian and Alaska Native Relations, 12/05/1997; Roadless Area Conservation Rule. Federal Register 66(9) January 12, 2001; Tribal Consultation on Section 8105 of the Food, Conservation and Energy Act of 2008 (The Farm Bill); 16 U.S.C. 2104 Note Stewardship End Result Contracting Projects.

## **Minerals Resources**

***Code of Federal Regulations***

36 CFR 228 Subpart E, Oil and Gas Resources.

***Forest Service Manual***

FSM 2320 Wilderness Management; FSM 2802 and 2803 Minerals and Geology, Objectives and Policy; FSM 2814 Mining Claims, Rights, and Obligations of the United States; FSM 2822.41 Mineral Licenses, Permits, and Leases Administer by the Department of the Interior, Forest Service Evaluation and Report; 36 CFR 228 Minerals; FSM 2850 Mineral Materials; Surface Occupancy Standards and Guidelines for Oil and Gas Exploration and Development (the Gold Book) published by BLM; FSM 2822.62, Actions by Forest Service; FSM 2814.01, Mining Claims, Rights of United States; FSM 2814.23 Prevent Violations of Laws and Regulations; FSM 2822.02 Mineral Leases, Permits, and Licenses, Objective; FSM 2822.04 Responsibility; FSM 2880.3 Geologic Resources, Hazards and Services, Policy.

***Other***

Final Programmatic Geothermal Leasing Programmatic Environmental Impact Statement for Geothermal Leasing in the Western U.S. (USDI Bureau of Land Management and USDA Forest Service 2008)

## **Heritage Resources, Tribal Relations, and Uses**

***Executive Orders***

EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, EO 13175 Consultation and Coordination with Indian Tribal Governments; EO 13007 Indian Sacred Sites; EO 13287 Preserve America, (Partnering to Promote Heritage Tourism in Communities: Guidance for Federal Agencies 2003); EO 11593 Protection and Enhancement of the Cultural Environment.

***Congressional Acts***

National Historic Preservation Act Sections 106 and 110; The Native American Grave Protection and Repatriation Act; American Indian Religious Freedom Act, 1978; Archaeological Resources Protection Act, 1979; Food Conservation and Energy Act of 2008 (The Farm Bill).



***Code of Federal Regulations***

36 CFR 800 Protection of historic Properties; 36 CFR 60.4 National Register of Historic Places, Criteria for Evaluation.

***Forest Service Manual***

FSM 1500 External Relations, Chapter 1560-State, Tribal, County, and Local Agencies; Public and Private Organizations; FSM 2360 Heritage Program Management; FSM 2360.7 Heritage Program Management, Program Funding Structure; FSM 2364.03 Protection and Stewardship, Policy; FSM 2364.02 Objectives, American Indian Religious Freedom Act, 1978; FSM 2360.7 Heritage Program Management, Program Funding Structure; FSM 2364.03 Protection and Stewardship, Policy; FSM 2364.02 Objectives.

***Other***

Memorandum of Understanding Among the U.S. Department of Defense, U.S. Department of the Interior, U.S. Department of Agriculture, U.S. Department of Energy, and the Advisory Council on Historic Preservation Regarding Interagency Coordination and Collaboration for the Protection of Indian Sacred Sites, November 2012; Report to the Secretary of Agriculture, USDA Policy and Procedures Review and Recommendations: Indian Sacred Sites, December 2012; Region 3, First Amended Programmatic Agreement Regarding Historic Property protection and Responsibilities (and associated appendices), December 2003; U.S. Forest Service Tribal Relations Strategic Plan.

**Roads and Facilities**

***Code of Federal Regulations***

36 CFR 212 Travel Management; 36 CFR 261 Prohibitions. 36 CFR Part 294, Roadless Area Conservation Rule. Federal Register 66(9) January 12, 2001.

***Forest Service Manual***

FSM 5460 Right-of-Way Acquisition; FSM 7701.2 Travel Management; FSM 7702 Travel Management, Objectives; FSM 7703 Travel Management, Policy; FSM 7710 Travel Management, Travel Planning; FSM 7730 Road Operation and Maintenance.

***Forest Service Handbook***

FSH 2509.22 Soil and Water Conservation Handbook; FSH 7709.55 Travel Planning Handbook; FSH 7709.56 Road Preconstruction Handbook; FSH 7709.59 Road System Operations and Maintenance Handbook.

***Other***

Forest Service Washington Office correspondence dated November 10, 2010, RE: Travel Management, Implementation of 36 CFR, Subpart 212, Subpart A (36 CFR 212.5(b); Forest Service Washington Office correspondence Re: Fiscal Year 2010 Final Program Direction; “Built Environment Image Guide” (USDA Forest Service 2001)

Amended Memorandum of Understanding among the Arizona Department of Transportation, the Federal Highway Administration, Arizona Division, and the USDA, Forest Service, Southwestern Region Regarding the Construction, Operation and Maintenance of Highways in Arizona Crossing National Forest System Lands.

## **Lands Adjustments**

General Exchange Act of 1922; Small Tracts Act of January 12, 1983 (96 Stat. 2535; 16 U.S.C. 521c-i); National Forest Townsite Act of July 31, 1958 (72 Stat. 483; 7 U.S.C. 1012a; 16 U.S.C. 478a) as amended by Section 213 of the Federal Land Policy and Management Act of 1976 (90 Stat. 2760);

### ***Code of Federal Regulations***

36 CFR 254 Landownership Adjustments.

### ***Forest Service Manual***

FSM 5400 Landownership; FSM 2354.51(a) Fee Title Acquisition on Designated Rivers; FSM 2354.6 Non-designated Rivers.

### ***Forest Service Handbook***

FSH 5409.12 Appraisal Handbook; FSH 5409.13 Land Acquisition Handbook; FSH 5409.17 Rights-of-Way Acquisition Handbook; FSH 5509.11 Title Claims, Sales, and Grants Handbook.

## **Special Uses**

### ***Congressional Acts***

Act of 1866 General Mining Law; Act of March 3, 1925 (43 Stat. 1133, as amended); The Act of March 4, 1915, as amended July 28, 1956, (16 U.S.C. 497); The Act of November 16, 1973, (30 U.S.C. 185), amending Section 28 of the 1920 Mineral Leasing Act; Alaska National Interest Lands Conservation Act, 1980; An Act to Repeal Timber-Culture Laws, 1891; Archaeological Resources Protection Act of 1979; Bankhead-Jones Farm Tenant Act of 1937, Section 31-33; Colorado Ditch Act of 1986 (FLPMA amendment); Energy Policy Act of 2005; Education Land Grant Act; Exchange for Schools Act (Sisk Act) of December 4, 1967 (81 Stat. 531, as amended; 16 U.S.C. 484a, 521c-521i); Federal Land Policy and Management Act of 1976; Forest Service Facilities Realignment Act of 2005 (119 Stat 559-563; 16 U.S.C. 580d, as amended); General Exchange Act of 1922; Granger-Thye Act of 1950, section 7; Highway Act of August 27, 1958, (23 U.S.C. 317), supplemented by the Act of October 15, 1966 (49 U.S.C. 1651); Land and Water Conservation Fund Act of September 3, 1964; Mineral Leasing Act of 1920, as amended on November 16, 1973, (30 U.S.C. 185(1)); National Forest Roads and Trails Act 1964; Oil and Gas Pipeline amendment to the Mineral Leasing Act, Section 28 authorizes oil and gas pipelines; Organic Act of 1897 provides for rules to regulate occupancy and use of the Forest Reserves; Occupancy Permits Act (March 4, 1915); Preservation of American Antiquities Act of June 8, 1906; Ski Area Recreational Opportunity Enhancement Act of 2011, which amended the National Forest Ski Area Permit Act of 1986; Small Tracts Act of January 12, 1983 (96 Stat. 2535; 16 U.S.C. 521c-i); Telecommunications Act of 1996 (Public Law 104-104); Term Permit Act of March 4, 1915, amended July 28, 1956; National Forest Townsite Act of July 31, 1958 (72 Stat. 483; 7 U.S.C. 1012a; 16 U.S.C. 478a) as amended by Section 213 of the Federal Land Policy and Management Act of 1976 (90 Stat. 2760); Water Conveyance Act of 1986 amended FLPMA; Weeks Law of March 1, 1911 (36 Stat. 961 as amended; 16 U.S.C. 516).

### ***Executive Orders***

EO 11990 Wetlands; EO 11988 Floodplains.

### ***Code of Federal Regulations***

36 CFR 251 Subpart B Land Uses, Special Uses; 36 CFR 254, subpart A.

***Forest Service Manual***

FSM 2700 Special Uses Management, FSM 2340 Privately Provided Recreation Opportunities.

***Forest Service Handbook***

FSH 2709.11 Special Uses Handbook.

***Other***

Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines (USFWS direction) (these guidelines will be superseded by the guidelines developed by the U.S. Fish and Wildlife Service Wind Turbine Guidelines Advisory Committee, once they are finalized and adopted by the Secretary of the Interior); Avian Power Line Interaction Committee (APLIC) Guidelines; Edison Electric Institute, Washington, DC. Standard Guidance for Towers with Potential Impacts to Federally-Listed Species and Migratory Birds (document prepared by the U.S. Fish and Wildlife Service).

Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands, 2008 with 2011 supplement: Guidelines for Long-Range Planning. Available online at: <https://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands>

Memorandum of Understanding Among the Arizona Department of Transportation, the Federal Highway Administration, Arizona Division and the USDA, Forest Service, Southwestern Region Regarding the Construction, Operation and Maintenance of Highways in Arizona Crossing National Forest System Lands. 2008. Available online at: <http://www.azdot.gov/docs/default-source/business/mou-usda-forest-svc-appendix-c.pdf?sfvrsn=6>

Memorandum of Understanding Among the U.S. Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Environmental Protection Agency, The Council on Environmental Quality, The Federal Energy Regulatory Commission, The Advisory Council on Historic Preservation, and Department of Interior, Regarding Coordination in Federal Agency Review of Electric Transmission Facilities on Federal Land. 2009.

Memorandum of Agreement between the United States Department of Agriculture, Forest Service Coconino National Forest and the Advisory Council on Historic Preservation and the Arizona State Historic Preservation Officer Regarding the Arizona Snowbowl Ski Area Proposed Modifications. 2005.

## **Recreation**

### **Developed Recreation**

***Congressional Acts***

National Trails System Act, 2009.

***Code of Federal Regulations***

36 CFR 213 Administration of Lands under Title III of Bankhead-Jones Farm Tenant Act by the Forest Service; 36 CFR 261 Prohibitions; EO 11988 Floodplain Management.

***Forest Service Manual***

R3 Supplement to FSM 2300 Recreation, Wilderness, and Related Resource Management; FSM 2310 Planning and Data Management; FSM 2311 Resource Opportunities in Recreation Planning; FSM 2330.3 Publicly Managed Recreation Opportunities, Policy; FSM 2343.1 Ski Areas; FSM 2353.16 Trail, River and Similar Recreation Opportunities; Cooperative Agreements and Rights-of-Way; FSM 2390 Interpretive Services; FSM 2703; 2710; 2721.61; FSM 5340.2 Law Enforcement, Objectives; FSM 5420 Land Purchases and Donations; FSM 7151.02 Land Surveying, Objectives; FSM 7312.1 and 7312.2 Facility Planning, Plans, and Preliminary Project Analysis; FSM 7320, Tramways, Funiculars, Ski Lifts, Conveyors, and Tows; and FSM 7330, Aerial Adventure Courses FSM 7400 Public Health and Pollution Control Facilities.

***Forest Service Handbook***

FSH 7409.11, Sanitary Engineering and Public Health Handbook; Forest Service Outdoor Recreation Accessibility Guidelines, 5/22/2006; FSM 2303 Recreation, Wilderness and Related Resource Management, Policy; FSM 2334 Recreation, Wilderness, and Related Resource Management, Campgrounds and Picnic Grounds. FSH 2709.14, chapter 60, Winter Recreation Resorts and other Concessions Involving Winter Sports; FSH 7309.11 Ch 40 Buildings and Related Facilities, Management; Forest Service Outdoor Recreation Accessibility Guidelines;

“Cleaning Recreation Sites” (USDA Forest Service 1995)

**Dispersed Recreation, Trails and Trailheads*****Code of Federal Regulations***

36 CFR 212, Travel Management; 36 CFR 251, Land Uses; 36 CFR 261, Prohibitions; 36 CFR 294, Special Areas.

***Forest Service Manual***

FSM 1802 and 1803 Senior, Youth and Volunteer Programs, Objectives and Policy.

***Forest Service Handbook***

FSH 2309.18.4 Trails Management Handbook; FSH 2309.18 Trails Management Handbook Chapter 10- Trail Planning; FSM 2300, Recreation, Wilderness, and Related Resource Management.

***Other***

1987 Coconino National Forest Land and Resource Management Plan, as Amended; Coconino National Forest Motor Vehicle Use Map; Travel Management Rule, 2005.

**Scenic Resources*****Code of Federal Regulations***

36 CFR 213.3 Part B Administration of Lands under Title III of the Bankhead-Jones Farm Tenant Act by the Forest Service: Protection, occupancy, use, administration, and exercise of reservations.

***Forest Service Manual***

FSM 2380.13 Landscape Management, Scenic Trails and Byways; FSM 2380.6- 2380.62 Technical Publications and References, Current Publications, Superseded Reference; FSM 2380.14 Landscape Management, Wild and Scenic Rivers; FSM 2380.18 Landscape Management, Landownership Adjustments ; FSM 2380.3 Landscape Management, Policy; FSM 2380.31 Landscape Management, Resource Planning and Management; FSM 2380.43

Landscape Management, Responsibility, Forest Supervisor; FSM 2382.1 Landscape Management, Scenery Management, Scenery Management System.

***Forest Service Handbook***

Landscape Aesthetics Handbook (US Forest Service Agriculture Handbook No. 701); FSH 1909.12 (13.13a).

***Other***

Landscape Character Descriptions, Coconino National Forest (2016)

## **Management Areas**

### **San Francisco Peaks Management Area**

***Other***

Master Development Plan for the Arizona Snowbowl (2010)

### **Pine Belt Management Area**

***Other***

Pine Grove, Rattlesnake, and Woods Seasonal Closure Areas (Order No. 04-00-146); Woody Ridge Seasonal Closure Area (Order NO. 04-15-01)

### **C.C. Cragin Watersheds Management Area**

***Congressional Acts***

108-451 Arizona Water Settlements Act (Dec. 10, 2004)

Public Law 112-45 Land Withdrawal and Reservation for Cragin Project (Nov. 7, 2011)

***Other***

Memorandum of Understanding – Restoration of C.C. Cragin Reservoir Watersheds (FS Agreement # 14-MU-11030407-037) between Salt River Project, Agricultural Improvement and Power District, National Forest Foundation, Town of Payson, USDA Bureau of Reclamation, USDA Coconino National Forest (July 11, 2014)

### **Verde Valley Management Area**

***Other***

Beaver Creek Vision 2020, Beaver Creek Regional Council; Ladders Bald Eagle Breeding Area Seasonal Closure (Order No. 04-16-21-W)

## **Special Areas**

### **Designated Wilderness Areas**

***Congressional Acts***

1964 Wilderness Act.

***Forest Service Handbook***

FSH 1909.12 Chapter 70 Wilderness Evaluation, Subsection 71.1 Criteria for Including Improvements; FSH 1909.12 Chapter 70 Wilderness Evaluation, Subsection 72.1 Capability; FSH 1909.12, FSH 1909.12 Chapter 70 Wilderness Evaluation, Subsection 72.3 factors to consider.

***Other***

Monitoring Selected Conditions Related to Wilderness Character: A National Framework, USDA Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-151. Policies and Guidelines for Fish and Wildlife Management in National Forest and Bureau of Land Management Wilderness (as amended June 2006)

**Designated and Eligible Wild and Scenic Rivers**

***Congressional Acts***

Wild and Scenic Rivers Act of 1968.

***Forest Service Manual***

FSM 2354.02 Trail, River, and Similar Recreation Opportunities, Objective; FSM 2354.03 Trail, River, and Similar Recreation Opportunities, Policy; FSM 2354.04 Trail, River, and Similar Recreation Opportunities, Responsibility; FSM 2354.21 Recreation, Wilderness, and Related Resource Management, Management of Study Rivers; FSM 2354.42 (a-p) Wild and Scenic River Resource Protection and Management.

***Other***

Verde Wild and Scenic River Comprehensive River Management Plan (USDA Forest Service 2004)

Forest Service, U.S. Department of Agriculture. (December 2010d). *The Upper Verde River Eligibility Report Update for the National Wild and Scenic River System*. Prepared by Prescott National Forest, Prescott, AZ.

Forest Service, U.S. Department of Agriculture. (September 2015). *Inventory and Eligibility Review for the National Wild and Scenic River System*. Prepared by Coconino National Forest, Flagstaff, AZ.

**National Trails**

***Congressional Acts***

National Historic Preservation Act Sections 106 and 110; National Trails System Act of 1968; Transportation Equity Act for the 21st Century of 1998, or most recent reauthorizing legislation.

***Code of Federal Regulations***

36 CFR 800 Parks, Forests, and Public Property, Advisory Council on Historic Preservation; 36 CFR 60.4 National Register of Historic Places, Criteria for Evaluation.

***Forest Service Manual***

FSM 2300 Recreation, Wilderness, and Related Resource Management; FSM 2353.11 Recreation, Wilderness, and Related Resource Management, Chapter 50 Trail, River, and Similar Recreation Opportunities, Relationship Between National Recreation, National Scenic, and National Historic Trails and National Forest System Trails; FSM 2380.13 Landscape Management, Scenic Trails and Byways.

***Other***

Arizona Trail Management Guide (Arizona State Parks 1995)

## Scenic Roads

### *Congressional Acts*

National Historic Preservation Act Sections 106 and 110; National Trails System Act of 1968; Transportation Equity Act for the 21st Century of 1998, or most recent reauthorizing legislation.

### *Code of Federal Regulations*

36 CFR 800 Parks, Forests, and Public Property, Advisory Council on Historic Preservation; 36 CFR 60.4 National Register of Historic Places, Criteria for Evaluation.

### *Forest Service Manual*

FSM 2300 Recreation, Wilderness, and Related Resource Management; FSM 2353.11 Recreation, Wilderness, and Related Resource Management, Chapter 50 Trail, River, and Similar Recreation Opportunities, Relationship Between National Recreation, National Scenic, and National Historic Trails and National Forest System Trails; FSM 2380.13 Landscape Management, Scenic Trails and Byways.

### *Other*

Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands, 2008 with 2011 supplement: Guidelines for Long-Range Planning. Available online at: <https://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands>

Memorandum of Understanding Among the Arizona Department of Transportation, the Federal Highway Administration, Arizona Division and the USDA, Forest Service, Southwestern Region Regarding the Construction, Operation and Maintenance of Highways in Arizona Crossing National Forest System Lands. 2008. Available online at: <http://www.azdot.gov/docs/default-source/business/mou-usda-forest-svc-appendix-c.pdf?sfvrsn=6>

Corridor Management Plans

## Established and Proposed Research Natural Areas (RNA), and Designated Botanical and Geological Areas

### *Forest Service Manual*

FSM 4063.02 Research Natural Areas, Objectives and FSM 4063.03 Research Natural Areas, Policy; FSM 4000 Research and Development, Chapter 4060, Research Facilities and Areas, Policy; FSM 2880 Geologic Resources, Hazards and Services, Chapter Section 2882.8 Special Interest Areas and Research Natural Areas; FSM 2300 Recreation, Wilderness and related Resource Management, Chapter 2370 Special Recreation Designations.

### *Other*

RNA Establishment Reports.

## Inventoried Roadless Areas

### *Code of Federal Regulations*

36 CFR Part 294, Roadless Area Conservation Rule. Federal Register 66(9) January 12, 2001.



# Appendix E. Terrestrial ERUs and Riparian Forest Types

## Introduction

This appendix is divided into three parts: an introduction, terrestrial ERUs, and riparian forest types. Terrestrial ERUs include major forest and woodland ecosystems and non-forest or non-woodland terrestrial (non-riparian) ecosystems. Riparian forest types occur mainly along stream ecosystems and range from low to high elevation.

The Terrestrial ERUs section is broken into two parts: major ecosystems with desired conditions developed by the Southwest Region (as of January 2011) and other ecosystems without desired conditions developed by the Region. The major ecosystems are Pinyon-Juniper with Grass, Pinyon Juniper Evergreen Shrub, Pinyon Juniper Woodland, Ponderosa Pine, Mixed Conifer with Frequent Fire, Mixed Conifer with Infrequent Fire, and Spruce-Fir ERUs. Seral stages for these major ecosystems are determined using the Vegetation Dynamic Development Tool (VDDT). VDDT is used to simulate changes in vegetative composition and structure using disturbance probabilities and pathways data and to help estimate condition and trend. The seral stage proportions are a standard expression of the narratives from the R3 Vegetation Desired Conditions Working Group, and reflect the approximate mid-points of the ranges, as described in the desired conditions included in the Plan for these ecosystems.

In addition to the major ecosystems mentioned above, the Forest has identified several other terrestrial ecosystems that are appropriate to address in the Plan: Interior Chaparral, Semi-desert Grassland, Great Basin Grassland, Montane/Subalpine Grassland ERUs. Following the approach the Region used for developing desired conditions for the major ecosystems, the Forest is using the seral stage proportions for reference conditions to describe the desired conditions for Interior Chaparral, Semi-desert Grassland, Great Basin Grassland, Montane/Subalpine Grassland ERUs. Reference conditions were derived from LANDFIRE (Landscape Fire and Resource Management Planning Tools) by the Southwest Region.

Seral stage proportions for modeled states should be assessed at the scale of the entire ERU within a Forest boundary or greater. Seral stage proportions are rarely, if ever, applied at the project level. For instance, the application of seral stage values for spruce-fir forests that typically have long stand replacement intervals and large patch dynamics, may only be appropriate at subregional scales.

The Forest also identified three riparian forest types that are appropriate to address in the Plan: Cottonwood Willow, Mixed Broadleaf, and Montane Willow.

## Terrestrial ERUs

The following tables for terrestrial ERUs provide quantitative and qualitative desired condition values for seral stages of major forest and woodland ecosystems and for Interior Chaparral, Semi-desert Grassland, Great Basin Grassland, and Montane/Subalpine Grassland ERUs on the Coconino National Forest. Model states and reference percentages are numerical representations of some of the desired conditions for these ERUs at landscape scales.

## Pinyon-Juniper ERUs

**Table 16. VDDT model states and reference percentages for Pinyon Juniper ERUs**

<b>State (VDDT model)</b>	<b>State (Qualitative)</b>	<b><u>Reference %</u> PJ Evergreen Shrub</b>	<b><u>Reference %</u> PJ Woodland (Persistent)</b>	<b><u>Reference %</u> PJ with Grass</b>	<b>Size and Cover Class</b>
A	Early Development	5%	10%	5%	Recently burned, grass, forb, and shrub types
B, E, C	Mid-Open	55%	5%	25%	Seed/sap-open Seed/sap-closed Small-open
D	Late-Open	40%	10%	50%	Medium-open, very large- open
F	Mid-Closed	0%	15%	10%	Small-closed
G	Late-Closed	0%	60%	10%	Medium-closed, very large-closed

## Ponderosa Pine ERU

(See Ponderosa Pine Evergreen Oak below.)

**Table 17. VDDT model states and reference percentages for Ponderosa Pine ERU\***

State (VDDT Model)	State (Qualitative)	Reference %	Description, Size and Cover Class
A, N	Early Development	0%	Recently burned grass, forb, and shrub types
B, F	Early forest	1.4%	<b>Seed/sap-open</b> <b>Seed/sap-closed</b> Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. >10% tree cover
C	Young forest	1.4%	<b>Small-open</b> Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. <30% cover
D, J, E, K	Mid-age forest, Mature/old forest w/ regeneration,	88%	<b>Medium-open</b> (even & uneven-aged) <b>Very Large-open</b> (even & uneven-aged) Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as Medium-open/uneven-aged, versus high-productivity sites where Very large-open/uneven-aged is more likely. <30% cover
G	Young forest	1.4%	<b>Small-closed</b> Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. >30% cover
H, L, I, M	Mid-age forest, Mature/old forest w/ regeneration,	7.8%	<b>Medium-closed</b> (even & uneven-aged) <b>Very Large-closed</b> (even & uneven-aged) Conditions indicative of mature closed forest habitat and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2010), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as Medium-closed, versus high-productivity sites where Very large-closed is more likely. >30% cover

\*Reference proportion is based on a combination of PIPO-Gambel oak (40%) and PIPO bunchgrass (60%). The desired openings for grass, forb, and shrub understory vegetation are built into open single storied states and throughout the multistoried states, but are not identified separately. States A and N are attributed to larger than desired openings being created by wildfires (with undesired effects) with a longer time period to return to a forested stated.

## Ponderosa Pine Evergreen Oak

Table 18. VDDT model states and reference percentages for Ponderosa Pine Evergreen Oak

State (VDDT Model)	State (Qualitative)	Reference %* for systems with Arizona white oak	Reference %* for systems with NO Arizona white oak	Description, Size and Cover Class
A	Early Development	4%	4%	Recently burned, grass, forb, and shrub types
F	Early forest	5%	5%	<b>Seed/sap-open</b> <b>Seed/sap-closed</b> Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. >10% tree cover
B	Young forest	3%	13%	<b>Small-closed</b> Reference conditions and conditions indicative of even-aged stand dynamics and the development of MSO habitat
C	Young forest	24%	3%	<b>Small-open</b> Conditions indicative of occasional even-aged stand dynamics and the development of closed mature forest habitat. <30% cover
D	Mid-aged and Very Large	60%	60%	<b>Mid-aged and Very Large Open</b> Reference condition
E	Mid-aged and Very Large	4%	15%	<b>Mid-aged and Very large – Closed</b> Conditions indicative of MSO habitat and mature closed-forest conditions

## Mixed Conifer with Frequent Fire ERU

Table 19. VDDT model states and reference percentages for Mixed Conifer with Frequent Fire ERU

State (VDDT Model)	State (Qualitative)	Reference %	Description, Size and Cover Class
A,N, B, F	Early Development, all structures	9%	<b>Seed/sap-open</b> <b>Seed/sap-closed</b> Recently burned, grass, forb, and shrub types, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
C	Mid development, open	3%	<b>Small-open</b> Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
D, J, E, K	Late development, open	60%	<b>Medium-open</b> (even & uneven-aged) <b>Very Large-open</b> (even & uneven-aged) Based on reference condition, and the predominance of uneven-aged dynamics and open forest. The plurality of stands on low-productivity sites likely to occur as Medium-open/uneven-aged, versus high-productivity sites where Very large-open/uneven-aged is more likely.
G	Mid development, closed	3%	<b>Small-closed</b> Reference condition, and conditions indicative of even-aged stand dynamics and the development of MSO habitat.
H, L, I, M	Late development, closed	25%	<b>Medium-closed</b> (even & uneven-aged) <b>Very Large-closed</b> (even & uneven-aged) Conditions indicative of mature closed forest habitat and occasional even-aged dynamics that occurred in the reference condition (Romme et al. 2010), particularly on north facing slopes and canyons. The plurality of stands on low-productivity sites likely to occur as Medium-closed, versus high-productivity sites where Very large-closed is more likely.

## Mixed Conifer with Infrequent Fire ERU

Table 20. VDDT model states and reference percentages for Mixed Conifer with Infrequent Fire ERU

State (VDDT Model)	State (Qualitative)	Reference %	Description, Size and Cover Class
A	Early Development	7%	Recently burned, Grass/forb w/ aspen or oak ramets, 10-40% tree cover
B	All aspen, and evergreen-deciduous mix tree types	21%	<b>Seed/sap, small, medium, and very-large - all cover classes.</b> Aspen/mixed-aspen forest, >40% tree cover, dominated by aspen or oak, conifer understory.
C, G	Early, Mid development-	18%	<b>Seed/sap, small - all cover classes</b> <b>Seed/sap-open, small-open</b> Mixed conifer forest w/ regeneration, 20-60%+ tree cover (shade-intolerant trees)
D, H	Mid, Late Development	14%	<b>Medium - all cover classes</b> Mixed conifer forest w/ regeneration, 20-60%+ tree cover (shade-intolerant, intermediate & tolerant trees)
E, F	Late Development - closed	40%	<b>Very Large-closed</b> Mixed conifer old forest w/ regeneration, 20-60%+ tree cover. Higher proportions can be expected for associations with longer stand replacement intervals (shade-intolerant & tolerant trees)

## Spruce-Fir ERU

Table 21. VDDT model states and reference percentages for Spruce-Fir ERU

State (VDDT Model)	State (Qualitative)	Reference %	Description, Size and Cover Class
A	Early Development	9%	Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. 10-40% tree cover
B	Early Forest	13%	<b>Seed/sap, small, medium, and very-large - all cover classes.</b> Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. Aspen/mixed - aspen, 0-10%
C, G	Early, Mid development-	22%	<b>Seed/sap, small - all cover classes</b> <b>Seed/sap-open, small-open</b> Conifer early forest, 10-20%. Grass/forb seedling/sapling w/ aspen, Douglas-fir, spruce, fir. Aspen/mixed -aspen early forest, 0-10%. (shade-intolerant, intermediate & tolerant trees)
D, H	Young forest with regeneration	15%	<b>Medium - all cover classes</b> (shade-intolerant, intermediate & tolerant trees)
E, F	Mature/old forest w/ regeneration	44%	<b>Very Large-closed</b> Mature/old forest w/ regeneration (shade-intolerant & tolerant trees)

## Interior Chaparral ERU

Table 22. VDDT model states and reference percentages for Interior Chaparral ERU

State (VDDT Model)	State (Qualitative)	Reference % Composition	Description, Size and Cover Class
A	Early: grass, forb	2%	Recently burned, sparsely vegetated, and all corresponding herb types
B	Early-mid: grass, shrub	5%	Grass & Shrub-Open All corresponding shrub types
C, D	Mid-Late: dense shrub, no understory	93%	Dense shrub-closed AND all tree size and cover classes

## Semi-desert Grassland ERU

Table 23. VDDT model states and reference percentages for Semi-desert Grassland ERU

State (VDDT Model)	State (Qualitative)	Reference %
A	Grass forb regeneration	24%
B	Open perennial bunchgrass	76%
C	Perennial bunchgrass w/ shrubs and trees, open canopy	0
D	Shrubs and trees w/ perennial bunchgrasses	0

## Great Basin Grassland ERU

Table 24. VDDT model states and reference percentages for Great Basin Grassland ERU

State (VDDT Model)	State (qualitative)	Reference %
A	Early development – recently burned, sparsely vegetated, open canopy	5
B	Mid development – grass, forbs, open canopy	70
C	Late development – open; some shrubs, seedlings & saplings & some mid-size trees	20
D	Mid development – some very large shrubs, closed canopy & some very large trees, open canopy	5

## Montane/Subalpine Grassland ERU

Table 25. VDDT model states and reference percentages for Montane/Subalpine Grassland ERU

State (VDDT Model)	State (Qualitative)	Reference %
A	Early development, open canopy (herbaceous vegetation)	20
B/C	Mid development, open canopy (herbaceous vegetation)	80
D	Late development, closed canopy (trees, shrubs & herbaceous vegetation)	0



## Riparian Forest Types

The following table shows the relationship between Riparian Forests and Wetlands and Riparian ERUs. Riparian ERUs were developed during the Regional Riparian Mapping Project (USDA Forest Service 2013).

**Table 26. Riparian Forest and Riparian ERU Crosswalk**

	Riparian Forest Types and Wetlands			
Riparian ERU	CWRF	MBDRF	MWRF	WETLAND
Desert Willow	X			
Oak / Desert Willow	X			
Fremont Cottonwood / Shrub	X	X		
Narrowleaf Cottonwood / Shrub	X		X	
Sycamore - Fremont Cottonwood	X	X		
Arizona Walnut		X		
Arizona Alder – Willow		X	X	X
Willow – Thinleaf Alder			X	
Upper Montane Conifer / Willow			X	
Fremont Cottonwood – Conifer		X		
Narrowleaf Cottonwood – Spruce	X			
Ponderosa Pine / Willow		X	X	

## Appendix F. Index of Other Supporting Plan Documentation

The following documents significantly contributed to development of the plan components (desired conditions, objectives, standards, guidelines, suitability, and monitoring) and/or are evaluations which were required by the 1982 planning rule provisions. These documents are available on the Coconino NF planning website<sup>21</sup>.

- Analysis of the Management Situation
- Ecological Sustainability Report
- Economic and Social Sustainability Assessment
- Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds on the Coconino, Kaibab, and Prescott National Forests
- Final Environmental Impact Statement for the Coconino National Forest Land and Resource Management Plan
  - Public Collaboration and Involvement/Other Planning Efforts (Appendix B)
- Southwestern Region Climate Change Trends and Forest Planning
- Potential Wilderness Area Evaluation
- Wild and Scenic River Eligibility Evaluation
- Research Natural Areas Evaluations

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<sup>21</sup> <https://www.fs.usda.gov/detail/coconino/landmanagement/planning>